ADAPTATION

Transforming Existing Transit Systems for Millennials

Anna Eckberg

Spring 2014

North Dakota State University

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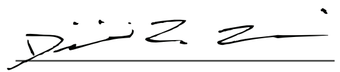
by Anna Eckberg

A Design Thesis Submitted to the Department of Architecture and Landscape Architecture of North Dakota State University

In Partial Fulfillment of the Requirements for the
Degree of Bachelor of Landscape Architecture

Primary Thesis Advisor



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"The essential part of
creativity is not being
afraid to **FAIL**."

TO YOU

my fiancé, Josh:

You always have always accepted me and my ambitions. I thank you for your constant love and support. You can always make me smile and laugh when I need to relax. Love you.

my parents, Eric & Jody:

Ever since I can remember you pushed me to be the best that I can be. You challenged me to learn and take on the world. You taught me to never settle. I won't ever forget to keep trying and if I fail at least I got somewhere. Love you.

my siblings, AJ & Emma:

You make me want to be better and change the world for you. Ironically, you teach me more about the world sometimes than anyone else. Keep being you. Love you.

my pets, Pooh Bear, Ginger, Tigger, & Betsy:

Thank you for loving me unconditionally and always being there to listen. You helped me keep my sanity. Love you my furry family.

anna marie eckberg
from bloomington | mn
currently at 4545 meadows lane | moorhead | mn

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ABSTRACT

The Millennial Generation, also known as Generation Y, has a different philosophy than previous generations when it comes to transportation and housing. According to Shyam Kannan, vice president at RCLCO, a leading real estate advisory firm, Millennials are drawn to neighborhoods in city centers and inner suburbs because "they are convenient and have a sense of community and character" (Broberg 2010, p. 2). Phineas Baxandall, a senior policy analyst for transportation reform (2013, p.12), says there is a 'structural shift rooted in changing demographics'. Millennials are driving less and expecting pedestrian-oriented transportation in their neighborhoods to supplement driving to their daily activities.

Transit networks in Midwest cities must become pedestrian-oriented to encourage Millennials to retain their residency, otherwise Millennials will move to cities such as Chicago that have transit-oriented neighborhoods. Adapting: Transforming Transportation for Millennials will act as a prototype for cities with populations between 100,000 and 500,000 that are lacking a complete streets approach to transit-oriented development. Complete streets are defined as streets that work for all users, not just those using a car. For neighborhoods to see the feasibility and necessity in shifting transportation infrastructure towards a complete streets approach, they need to see potential design solutions and reasoning behind the switch.

This thesis addresses the changing importance of vehicular transportation for individuals now and in the future. Can neighborhoods in Midwest cities with populations of 100,000 to 500,000 adapt their current transportation systems to meet the pedestrian-focused public transportation needs of Millennials and future generations? Research and analysis will prove that cities, such as Minneapolis can adapt their neighborhoods to encourage Millennials to retain and increase residency. Results could lead to future developments of efficient pedestrian-centered transportation infrastructure in small to mid-sized cities across the United States.

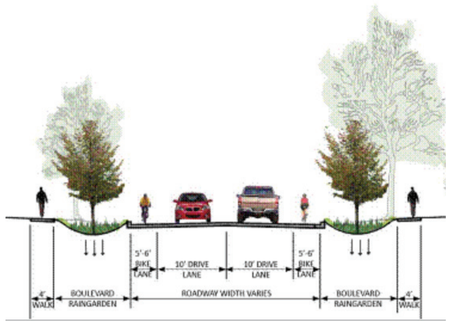


Figure i.a Typical section of a complete street

Keywords: Millennial generation, transit systems, transit-oriented, complete streets

CHAPTER 1: PROJECT TYPOLOGY & LITERATURE REVIEWS

UNDERSTANDING THE COMPONENTS OF TRANSIT-ORIENTED DEVELOPMENT & COMPLETE STREETS

Midwestern urban transportation systems create opportunities to connect all generations to cultural necessities. Through the implementation of complete streets, transit-oriented development, and multimodal transportation systems, such as sidewalks, bike lanes, bus stops, and transit hubs that connect to a larger transportation system, a transit zone one mile in diameter will be created. Drawing Millennials, Baby Boomers, and future generations because of their accessibility to daily amenities, transit zones create ideal neighborhoods.

Each generation is slightly different as world events have shaped the way they think and what they value. Millennials primarily interact through technology as they have grown up in a technologically booming era (Liotta, 2012). While Baby Boomers prefer to interact face to face as they have had to learn how to use technology later in life (Liotta, 2012). In a transit zone, people have the opportunity to incorporate technology and transportation to overcome generational differences and learn from one another.

Figure 1.b Example of Transit Oriented Development & Complete Streets

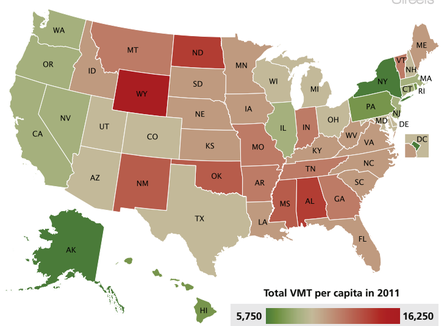


Figure 1c Vehicle Miles Traveled per Capita in 2011

Over time people have adapted to their surroundings and advancing technology. For the Millennial generation, people born between 1983 and 2000, adapting has been engrained within their being (Broberg, 2010, p.3). Acclimating themselves to continuously changing technology, transportation, and economic challenges has transformed their societal needs and values beyond that of Generation X, people born between 1965 and 1982, and the Baby Boomer generation, people born between 1946 and 1964 (Dutzik, 2013, p.20).

The Millennial generation, also known as Generation Y, Echo generation, or Next generation, has a different philosophy when it comes to transportation needs compared to previous generations (Broberg, 2010, p.1). According to Phineas Baxandall (2013, p.12), there is a 'structural shift rooted in changing demographics'. Millennials are driving less and expecting pedestrian-focused public transportation systems to supplement driving to their daily activities. Dutzik & Baxandall's A New Direction (2013, p.23-27) notes that Millennials express an overwhelming desire to live in a city where daily amenities and public transportation are within a walkable distance of their homes. Aging Baby Boomers are similarly driving less and moving back into urban areas from their traditional suburban homes to be close to daily amenities (Broberg, 2010, p.6).

Following this trend and comparing it to data found in U.S. Pirg's report Moving Off the Road by Phineas Baxandall (2013, p.6) people can see that people in Midwestern states are driving more on average than any other region in the United States (Figure 1-b). Yet Minnesota had up to five and a half percent of its working population working from home during that time. Additionally, 70 percent of Minneapolis residents were driving alone to work in 2010 because of a lack in public transportation options (City, 2013). If Minnesotan cities are to retain and increase Millennials' residency there needs to be a structural shift towards pedestrian-focused public transportation systems.

In order for Midwestern cities with populations ranging from 100,000 to 500,000 to see the feasibility and necessity in adopting a complete streets approach to transportation to make transportation pedestrian-oriented, they need to physically see potential design solutions and reasoning behind the switch. The thesis will be thought-provoking and provide potential and realistic options to adapt transportation to meet the values of 91 million Millennials across the United States (Broberg, 2010, p.3).

Designers, in the fields of landscape architecture, planning, and transportation, through this thesis are provided with examples of how to approach a transit-oriented development with a complete streets approach. It also lays out criteria that will help cities and neighborhoods evaluate their potential of achieving transit-oriented development. Finally, the design implications of the application of the results of this thesis have the potential to encourage interaction within the community and amongst generations.

The thesis is divided into three types of criteria: walkability, technology, and political interest in livability and transit. Under each category is a list of criteria and reasoning as to why they must be included in order to develop a complete project.

Walkability Criteria:

1. Public transportation is already incorporated into the infrastructure of the city. For the scope of this thesis there needs to be existing transportation infrastructure to build off of because transit zones are more effective when they are able to connect into a larger transportation system.

2. There is potential to create a multimodal transportation system. The site cannot be limited to one or two types of pedestrian-oriented transportation. If the site is limiting, the effectiveness of the design will fall short of its potential. Additionally, Millennials and Baby Boomers are looking to move into areas that provide accessibility to transportation all year long to a variety of amenities and this is difficult to accomplish with only one form of transportation available (AARP 2005).

3. Existing active or inactive rail lines are present on or within a mile of the site. Providing potential ties into railroad systems for the larger transit system.

4. Transportation is accessible to multiple generations. This criterion can be divided into two major components: the American with Disabilities Act (ADA) (United, 2013) and availability of transportation. In order for transit to follow ADA it must not discriminate as well as it must ensure equal opportunity for persons with disabilities. It also mandates the establishment of TDD/telephone relay services (United, 2013). Secondly, transportation must be available to all generations at a variety of times and locations. Various forms of transit must be accessible as well, such as sidewalks, bicycle paths, bus routes, and fixed transit. This falls under the parallel model of transportation as illustrated in Figure 2-c (Litman, 2006, p.5).

5. Previously, the public transit system has been underdeveloped or underutilized. This will be determined by Walk Score® Transit and Bike Score. A lack of score or a low score under transportation will exemplify this criterion.

6. Density of population is high because there will be enough people per square mile to sustain a transit system.

7. The city in which the site is located must have a current population of 100,000 to 500,000. Any less than 100,000 people makes sustaining a public transit system with transit zones difficult due to costs associated with transportation systems.

8. The site experiences all four seasons. This creates challenges and opportunities that will make the thesis important for future transit development in the Midwest.

9. Within the site there are at least the following cultural necessities: one grocery store, two places of worship, a hair salon, five commercial buildings, a park, a school, three restaurants, and residential buildings. These amenities are necessary for a sustainable neighborhood (Walk, 2013).

10. The existing walkability score is between 40 and 70 according to Walk Score®. This places the site between "car-dependent" and "somewhat walkable" depending on the score (Walk, 2013).

SITE CRITERIA

PROJECT TYPOLOGY & LITERATURE REVIEWS

Technology Criteria:

1. Technology is available to make public transportation more accessible. Mobile technology has increased the accessibility and understanding of public transportation. By downloading an application for a smartphone, a person can map a public transportation route. This makes routes readily available to people of all generations at the click of a few buttons, but it has had the greatest impact on Millennials due to their constant interaction with technology (Dutzik, 2013, p. 20).

2. Millennials currently live on the site and the median age for the city falls between 20 and 35, since Millennials are currently between the ages of 20 and 35. This is important because Millennials are the primary reason for adapting a new transit policy and incorporating technology into transportation.

Political Interest in Livability [& Transit] Criteria:

1. Within the past decade the city has developed a plan for improving transportation within the next 25 years. This shows the city's interest in improving the quality of life of its citizens by creating public policy that increases pedestrian-oriented transit infrastructure. This is important to the thesis, because if a city does not show interest in its citizens it will not consider adapting transit to meet the needs of Millennials or Baby Boomers.

2. Other Millennial values are present on the site such as amenities in close proximity (grocery store, restaurants, library, etc.). People are asking policy makers to increase the number of bicycle lanes, bus routes, and direct sidewalks to said amenities.

3. Millennial population has grown over the past decade. This criterion depicts that there is a population growth and hence a growth in demand for Millennial needs and wants, thus there is a need for political interest that reflects their needs and wants.

4. Baby Boomers are present within the population, which supports that a new or modified transportation policy is not only beneficial to Millennials, but other generations as well.

5. Potential to increase social interaction amongst generations through use of transportation. There are areas present in the neighborhood that encourage people to interact while waiting for the bus or transit line, such as cafes, benches, tables and shelters. These areas are political dreams because they build community support, which increases how people care for their neighborhood.

Parallel Model of Transportation

Walk ⟶ Improved Walking Conditions
Bicycle ⟶ Improved Cycling Conditions
Train/Bus ⟶ Improved Public Transit Service
Automobile ⟶ Improved Automobile Travel Conditions

Figure 1d Parallel Model of Transportation used to depict relationship between improvements and usage

Between September 2012 and May 2013, I travelled to Phoenix, Arizona; San Juan, Puerto Rico; New York City, and throughout England. During each trip I experienced different types and quality levels of public transit systems. Each system had a relatively short learning curve, with the exception of San Juan.

Phoenix has a light rail and bus system that connects different areas of the city. It is relatively timely and clean with connections to bus routes and availability to transport your bicycle on a bus or light rail train.

San Juan, Puerto Rico is completely different from Phoenix. Bus rides are packed with pedestrians like sardines in a can. A bus route that travels only three miles takes two and a half hours. To put the cherry on top of it all the busses are not on a schedule. Additionally, pedestrians have to fight bicyclists on sidewalks and taxis to cross the road.

In New York City their subways and bus routes are all well connected. Subway stations were easily navigable with reader boards at each station. Bus routes are a little inconsistent with timing and route information. In New York bicyclists use roadways as motorists, but do not have designated lanes, while pedestrians generally have ten foot wide, or greater, sidewalks to navigate, depending upon the borough they are in. My experience in New York was enjoyable, but somewhat daunting with how quickly one had to jump on a train and hope it was going in the right direction. If I got on the wrong train it was easy enough to get off, go up to street level, and get on the other train going in the correct direction.

May 2013 I travelled around England for ten days by train, bus, and foot only. It was wonderful not having the complications of a vehicle. Throughout the entire United Kingdom there are rail lines running with goods and pedestrians, all using the same tracks. These large rail trains connect cities together. Once within a city or district smaller trains, and sometimes busses, serve pedestrian transit within the city. All these forms of transportation are privately owned, but available to the public. A person can hop on a train and travel across the country in a matter of hours, all while reading, eating, working, or sleeping. In Liverpool, Manchester, and London the extensiveness of the rail lines is magnified, increasing the ease of travel exponentially. By far, England's transit system is the most complete.

Figure 1.e New York City Subway

After returning from England I knew that my broad thesis topic would address transportation systems. Through preliminary research of generational differences and transportation, I discovered that in the Midwest there is a lack of transit options available other than the automobile, such as rapid transit busses, light rail systems, and bike share programs. Additionally, I found that Millennials value access to daily amenities within a half mile of their house and transit options that allow for easy non-automobile transportation. These areas are known as transit zones (Center, 2004, p.7). Further I identified that Millennials' values are not being integrated to their full potential within certain cities. If their values are not being embraced, Millennials will move out of those cities instead of maintaining or increasing their residency. Thus I formed my thesis topic.

Figure 1.f Train near Manchester, UK

> Cities in the Midwest, with populations of 100,000 to 500,000, must transform their neighborhoods into transit zones that emphasize a complete street approach and connect to a larger transportation system in order to entice Millennials and Baby Boomers to remain residents.

To simplify the problem for the scope of this research, transportation options create connections to amenities and work for Millennials and Baby Boomers. The intent of the project is to create research applications that help adapt current neighborhoods in Midwestern cities of 100,000 to 500,000 to meet the needs of Millennials, Baby Boomers, and future generations. Thus the hypothesis is:

> If neighborhood x, in city y (in the Midwest) adopts a complete streets program for the transit zone – half-mile radius from the center of neighborhood x and develops a multimodal, complete streets, transit-oriented development through that area, then Millennials and Baby Boomers will move into the transit zone.

The example location and design portion of this thesis is located in southeast Minneapolis, MN. Thus the example hypothesis is:

> If Nokomis East Neighborhood in Minneapolis, Minnesota adopts a complete streets program for the transit zone – half-mile radius from the center of 54th Street East and 34th Avenue South – surrounding the area that intersects the neighborhoods of Keewaydin, Minnehaha, Morris Park, and Wenonah and develops a multimodal, complete streets, transit-oriented development through that area, then Millennials and Baby Boomers will move into the transit zone.

Follow-up research questions are divided into the same three categories of the criteria: walkability, technology, and political interest in livability and transit.

Walkability

1. What does a complete street mean and look like?

2. How can walkability be quantified?

3. What is transit-oriented development and what are its benefits?

4. What is a multimodal transit systems and what are its benefits?

5. How do different generations value walkability?

Technology

1. What types of mobile technology are used to make transportation more accessible?

2. Which generations use mobile technology more and what types do they use?

Political Interest in Livability and Transit

1. What public and private agencies support transit-oriented development, complete streets, and multimodal transit?

2. What forms of political interest are there?

3. What levels of government have influence on neighborhood transit development?

4. Who implements transit-oriented development, complete streets, and multimodal transit?

5. What are examples of future goals related to transportation?

In order to draw people to transit systems a site needs to be walkable. Walk Score® has articulated a formula to measure the walkability of any address (Walk, 2013). An address can be typed into the website and with a click a walk score, transit score, and bike score are formulated. Each score is based on a scale of zero to one hundred (Walk, 2013). The higher the score the more walkable the address is supposed to be. The formula has one flaw, it measures the direct distance, not the pedestrian route, to the amenity. Thus, further inventory and analysis is needed when designing a site. As economist Joe Cotright said, "If you have an eight-lane arterial without complete streets infrastructure, you will never see high-density walkable urbanism take place along the corridor" even though Walk Score® may say it is highly walkable (McCann, 2009, p.4).

In an effort to make sites more walkable a combination of aspects has to be taken into account by designers, residents, public officials, transportation analysts, etc. The availability of amenities within a defined area, in this project's case within a one mile diameter area, need to include the following cultural necessities: one grocery store, two places of worship, a hair salon, seven commercial buildings, a park, a school, five office buildings, three restaurants, and residential buildings. These amenities are necessary for a sustainable neighborhood (Walk, 2013). Walk Score® evaluates a site with these amenities to have a score between 40 and 70, placing the site between "car-dependent" and "somewhat walkable" site depending on the specific score (Walk, 2013).

Additionally, the condition of streets and transit systems is necessary in making amenities accessible to people of an area. A complete streets approach develops streets that are designed for all users, not just those using a car (Smart, 2010). By designing sidewalks to be six to ten feet wide and separated from roadways by a boulevard, walking can become an enjoyable and safe experience (Smart, 2010). Safer paths to amenities encourage people to walk and bicycle, and in turn encourages healthy living. Connecting safer pathways to public transit broaden the area in which people can reach amenities without their private vehicle.

Walkability is important to this thesis and public transit because the more amenities available within a neighborhood or transit zone, the more people want to walk. The key to walkability is providing safe and comfortable environments in which pedestrians can travel from their home to an amenity or transit stop, which is the basis for this thesis. Additionally, the more amenities available within a neighborhood or transit zone and the safer and more accessible the sidewalks, bicycle paths, and transit opportunities are the more Millennials, Baby Boomers and future generations will want to live in that area.

A New Direction illustrates that the driving boom has ended, thus bringing uncertainty to the future of transportation (Dutzik, 2013). Changes in transportation priorities among the Millennial generation, the advancement of technology, and other changes prove that the United States needs to create a new transportation policy that meets these changing needs.

Mobile phone technology has exponentially advanced since 1983 when the first cell phone became public (Softschools, 2013). Ten years later text messaging was developed, and nearly another decade later in 2002 the first smart phone was invented with the ability to send and receive photos, emails, and messages. Only five years later the first Apple iPhone was released featuring a touch screen and functioning essentially as a home computer. These technological advancements have changed the way people live and communicate.

Thirty years ago about one percent of people within the United States had a cell phone and today nearly everyone has a cell phone. According to CTIA (2013), an international nonprofit trade associate that represents the wireless communications industry, the United States as of December 2012 had 326.4 million wireless subscriber connections with a population of 315.1 million. This means that the number of active wireless devices as of December 2012 was 103.5 percent, but it still does not solidify that everyone has a wireless device because some people have multiple devices.

In Young Americans Lead Trend to Less Driving, Schwartz states that due to advancements in mobile technology, public transportation is becoming more accessible (2013). This is due to the availability of navigation applications (apps) for mobile devices (Zipcar, 2013). Examples of some of these apps are Google Maps, a voice guided turn-by-turn global positioning system (GPS), and HopStop, which provides detailed subway, bus, train, taxi, walking, and biking directions, real-time transit information, nearby station searches, and station-to-station schedule in over 600 cities. If implemented in a complete streets program to transit-oriented development, apps can significantly increase the accessibility of multimodal transit options to pedestrians. Zipcar surveyed 1,015 adults including 980 licensed drivers and found that transportation apps have also had a greater impact on Millennials' driving decisions than on the decisions of Baby Boomers (2013). When advertising transit apps, there needs to be specific advertising towards Baby Boomers to have them understand and know how an app can make travelling easier.

Mobile technology plays an increasingly important role within all aspects of people's lives. Apps for mobile devices make public transportation more accessible and feasible to all generations through real-time route information, therefore playing an important role within this thesis (Dutzik, 2013, p.20). Millennials have grown up with this technology and are drawn to areas that have adopted apps to make transit systems simple to navigate. Baby Boomers and other generations are learning about the power of apps, but do not use them with the same frequency as Millennials.

Like it or not, politicians and government programs plan, operate and maintain the majority of transportation systems in the United States. In order for transit systems to make a structural shift to pedestrian-oriented systems and complete streets there needs to be a strong political interest. The United States Department of Transportation has put together a draft of plans to improve the livability of communities through collaboration with HUD (Department of Housing and Urban Development) and the EPA (Environmental Protection Agency) for FY 2014-2018 (2013). The plan covers challenges, strategies, and ways to measure the successfulness of transportation improvements on the livability of communities (United, 2013).

Figure 1.g Emblems of the federal agencies associated with Livability in Transportation Guidebook Planning Approaches

Additionally, the Livability in Transportation Guidebook: Planning Approaches that Promote Livability issued by the United States Department of Transportation (DOT) determines six categories of livability: increased transportation choices, promote affordable housing, enhance economic competitiveness, support existing communities, coordinate federal policies and leverage funding, and value existing communities (Rue, 2013). Fifteen case studies were evaluated by the Livability in Transportation Guidebook based upon the six categories mentioned above. Eleven of the case studies fully support and four partly support an increase in transportation choices (Rue, 2013, p. ii). The U.S. DOT believes it is important that policy supports an increase in transportation choices within cities across the United States. Elizabeth Deakin also views sustainable transit as a part of a broader strategy of transportation and land use planning for sustainability (2003).

Within the past five years city transportation departments across the country, and recently the U.S. DOT, have shown interest in improving the quality of life of citizens by creating public policy that increases pedestrian-oriented transit infrastructure. This is important to this thesis because if a city does not show interest in improving the quality of life of its citizens it will not consider adapting transit systems to meet the needs of its citizens, which may be Millennials, Baby Boomers, or future generations. It is important that transportation departments start implementing complete street policies now, so current and future generations can enjoy the benefits.

CHAPTER 2: METHODOLOGY

RESEARCH APPROPRIATE TO THE THESIS & AN INTRODUCTION TO THE CONCEPTUAL SITE

RESEARCH APPROPRIATE

MEASURES

The pragmatic research approach will be used. It involves using the method which appears best suited to each specific research question. According to Alzheimer Europe (2012) pragmatic research grants the freedom to use any of the methods, techniques and procedures typically associated with quantitative or qualitative research. It recognizes that every method has its limitations and that the different approaches can be complementary. This is the most appropriate form of research for this thesis because it allows flexibility when deciding how to go about researching information.

The research objective is to develop the best possible adaptation for the existing neighborhoods of a city to become a transit zone. By transforming a neighborhood into a transit zone, it encourages Millennials and Baby Boomers, which make up the majority of the population, to reside in that neighborhood (Broberg, 2010, p.3). Through understanding these generations' values one can see that Millennials express an overwhelming desire to live in a city where daily amenities and public transportation are within a walkable distance of their homes (Dutzik, 2013, p.23). This data is found in quantitative research, such as the physical distance to a transit station or amenity. It is also found through qualitative research, such as what types of characteristics make a walk, five minutes long versus ten minutes long, even though both are the same physical distance. This is why the pragmatic research approach is used; depending upon the type of research needed to be conducted the best approach to conduct the specific type of research is utilized.

Methodology for conducting this research requires collecting relevant data from specified documents and databases. Demographic and transportation system data plays key roles throughout the entirety of this thesis. Sorting through Geographic Information Systems (GIS) and research study results narrowed demographic, quantitative, and transportation data to determine the specific city and neighborhood where the transit zone site for this thesis is. An example of data found through this methodology is the U.S. Census data on population trends. This information is needed to know whether Millennials are living in a city and where. An example of how research study results can be helpful is how they determine the cultural values of Millennials and Baby Boomers, which proves the need for more transit-oriented development.

The data collected is analyzed to develop a design concept that can be applied to neighborhoods across the West North Central Midwest United States. These findings help cities retain Millennial residents, thus stabilizing populations. The data and results are limited to available information. Census data was last collected in 2010, thus any information that is current as of 2013 is relatively subjective to projection results. As Millennials are only in their twenties and early thirties, not much is known about how they will act at as they age. Therefore, information is projected based upon values and actions Millennials are displaying now.

To evaluate if a city/site is a good potential candidate to adapt their current transit system into a complete streets, transit-oriented development Table A in Appendix B is an illustration of the criteria in this thesis. A city must prioritize the criteria then decide if it is currently being met. If a criterion is not being met a city can decide how they plan to meet the criterion or if it needs to be met before moving forward with a transit adaptation project.

Location Charlotte, North Carolina

Size

9.6mile corridor
15 Light Rail Stations
15 transit zones (1/2 mile radius of Light Rail Stations)
14 miles of sidewalks
1.5 miles of multi-use trails
10 miles of bicycle lanes
8 miles of street widening
7 streetscape improvement projects
27 intersection improvements

Consultants

Danny Pleasant, Director - Charlotte Department of Transportation; Laura Harmon, Assistant Director – Planning Services, Charlotte Mecklenburg Planning Department;
Tina Votaw, Transit-Oriented Development Specialist, Charlotte Area Transit System; Tom Warshauer, Community and Commerce Manager, Charlotte Neighborhood & Business Services

Agencies | Organizations Involved

City of Charlotte (Planning, Department of Transportation, Economic Development, and Charlotte Area Transit System)
Towns of Davidson, Huntersville, Cornelius, and Matthews

Year Configured

Mid-1990s to present

Funding Sources and Amounts

South Corridor: $463 million (47% Federal, 25% State, 28% local sales tax)
South Corridor Infrastructure Program (SCIP): $50 million, funded through government-issued bonds - $25 million set aside specifically for investing in the streets, sidewalks, and intersection improvements and was aimed at "building community". This enabled the corridor to be "transit-ready and optimized the transit-oriented development potential around each transit station" (Rue, 2013).
Smart Growth Fund (for South Corridor): $5 million revolving fund to purchase and assemble land around transit stations.
General funds (Rue, 2013).

Population Served & Modes Served

Metro Charlotte region residents; all modes

Summary of Project

Between 1970 and 1990, Charlotte experienced a population boom as the city developed into a financial center. In response to the population growth, the City of Charlotte implemented a forward-thinking regional growth strategy, which is focused around transit-oriented and community development.

Originally developed in 1994, the vision was to develop "future growth in centers along five radial corridors," establishing long-term growth management strategies for the region (Rue, 2013). In 2006, Charlotte, North Carolina, adopted the Transportation Action Plan, also known as TAP, and updated it in 2011. "TAP consists of the TAP Policy Document and the TAP Technical Document" each which respectively describes how politically and mechanically Charlotte is to adopt the plan (City, 2011). Through its implementation, TAP has utilized both approaches and is consistent with the original 1994 vision for the city's transit network, which discusses transit forms of centers, corridors, and wedges (Rue, 2013; City, 2011).

As elements of the transit system are developed and implemented the more people want to live within the transit zones (1/2 mile radius from the transit stops). Jacob Curtis, 29, a new resident to Charlotte, was noted in John Schwartz's article Young Americans Lead Trend to Less Driving, saying he was 'pleased to find a home close to rail and bus lines, and that he could ride his bike to the office along a no-traffic greenway." He also finds Charlotte easy to navigate with smartphone apps that "plot routes that blend biking and mass transit options" (Schwartz, 2013).

"The multi-corridor transit system's plan has begun to be implemented and is highly successful (both from ridership and transit-oriented development standpoints)" (Rue, 2013). Charlotte exemplifies how a growing city can adapt their transportation system to the needs of the city's residents while still considering community needs.

Figure 2.a Blue Line station and light rail

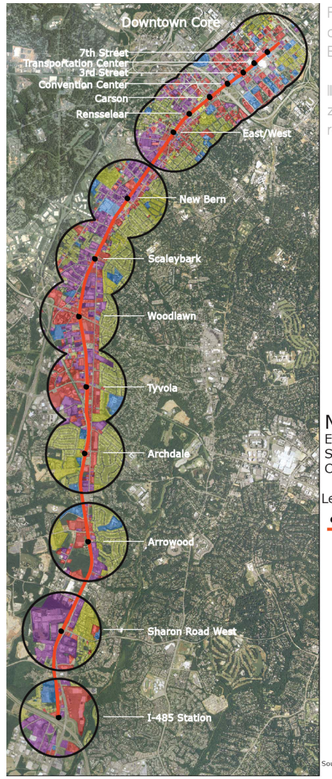


Figure 2.b Existing Land Use along the South Cooridor | Blue Line - Charlotte, NC

Illustrates 1/2 mile transit zones surrounding each light rail stop

Lessons Learned

Transit Project & Community Building: "Joint authorship and ownership of the transit project across various city departments broadened the perspective of each department's focus so that transportation is taken as a consideration," but not the only driving force of community goals. The project, in the end, became a community-building project and not just a mobility project (Rue, 2013). Collaboration is important in the development of any large scale projects.

Integrated Transit & Land Use Planning: The decision to build transit was paired with "land use planning, strategic infrastructure investment, and transit-supportive policies and regulations to ensure the success of the transit project (from a ridership standpoint) and realize the community vision" (Rue, 2013).

Applicable Values

Charlotte's successful integration of transit-oriented development in established neighborhoods is impeccable. Elements of a walkable neighborhood are present in the South Corridor after the design intervention. Multimodal public transportation is incorporated into the infrastructure of the city and is accessible to multiple generations through ADA accessibility and technology. Previously Charlotte's transit system was underdeveloped. With the increase in population over the past forty years, density has risen and will continue with the implementation of the transit-oriented developments surrounding the light rail stations. In the transit zones the City has planned cultural necessities to be incorporated if they were not already, such as grocery stores, commercial buildings, and restaurants.

Technology has also increased the accessibility of the transit system in Charlotte. Apps for smartphones make planning a route simple. These improvements have lowered the median age of residents that live in the half mile radius surrounding the transit stops.

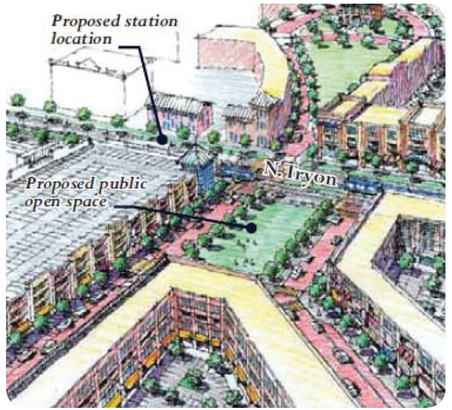


Figure 2.c Investment in infrastructure in station areas, consistent with the Centers, Corridors, and Wedges Growth Framework

Additionally, political interest in livability and transit are ever present in Charlotte with the implementation of TAP and their constant review and adoption of similar transportation improvement plans. By meeting these criteria and addressing the importance of transit-oriented development throughout the design process, Charlotte is an example of a successful implementation of transit-oriented development for this thesis.

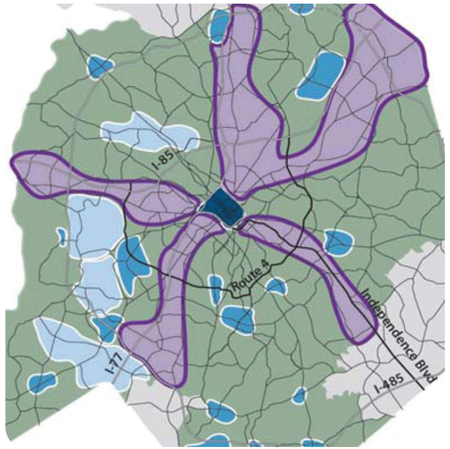


Figure 2.d Original concept plan for centers, corridors, and wedges

Figure 2.f Ride CATS, mobile app
Riders can receive up to date information and save routes for quick access

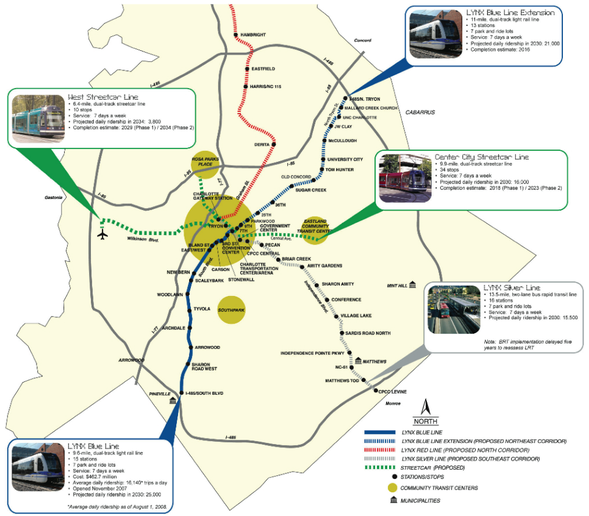


Figure 2.e Overall Charlotte, NC transit system

The Midwest was chosen because of its diverse seasonal weather and the current lack of transit options available. In Hidden in Plain Sight by the Center for Transit-Oriented Development (September 2004), Figure 2-g depicts how the West North Central section of the Midwest has only three metropolitan areas with transit. Two transits, which are newly starting, are in Minneapolis-St. Paul, MN and another is in Kansas City, MO. The only established transit within the West North Central Midwest is in St. Louis, MO and it is small compared to others across the country (Center, p. 16).

A Midwest city that would be a good canidate for applying the results of this thesis would have the following criteria. A population with 100,000 to 500,000 people because in order to financially sustain a transit system there needs to be frequent passenger usage. Not only does the city have to be over a certain population size, but it must be at least a mid-level to high density city (3,000+people /sq. mile) (City, 2013). Density helps focus the population because a city may have a population that fits within the criteria, but if it is too spread out then it is difficult to create an effective transit system.

Demographically, a city that is looking to adapt their transit system to a complete streets approach to transit-oriented development, the city should look at the average age of residents and if it has changed over the past decade. Ideal city candidates have maintained an average age of residents between 23 and 32 years old – the middle ages of Millennials – throughout the past decade. Additionally, candidates will have seen an increase in Baby Boomer residents in the past decade. Both these generations have shown that they value transit-oriented development neighborhoods (Dutzik, 2013, p.23).

A good indicator that a transit system is ineffective is how long and by what means are people travelling to work. A site that should consider improving their transit system typically has an average travel time to work of 15 to 45 minutes (City, 2013). This number is based on people travelling from outside of the city and from within the city. Additionally, if public transit is available and makes travel time less, people are more likely to use the public transit (Portland, 2009, p.4). Now, if the majority of people are travelling by car to work alone and the minority number of people are walking, bicycling, or riding the bus to work, the statistics show that there is a lack of use of the public transit (Portland, 2009, p.4). This is not to say that the existing public transit is ineffective, but it is not performing to its full potential because

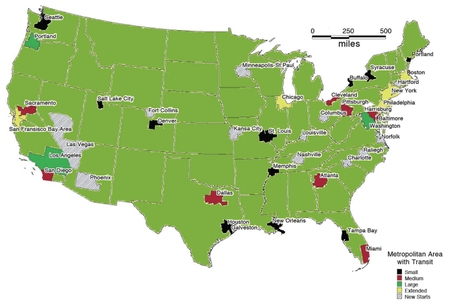


Figure 2.g Transit systems across the US

because it is not enticing people who drive themselves to work to switch to public transit. With a lower public transit commute times there is potential to replace individual car commute time to work with public transit commute options that would take the same amount of time or less.

The specific site will have a central point for the transit zone; the half mile radius circle that is the site (similar to Figure 2-b). According to the Center for Transit-Oriented Development (September 2004), a half mile radius is the farthest people are willing to walk to get to a transit stop to go somewhere. If the stop is further than a half mile away a person would rather drive their car (Center, 2004, p. 7). These half mile radius areas centered on a fixed transit station are called a transit zones (Center, 2004, p.7). When transportation is outside these transit zones people are more likely to drive than make the extra effort to get to a transit stop (Portland, 2009, p.21).

The most successful transit zones have grocery stores, multi-use buildings that contain office, retail, entertainment, and a variety of residential options. If any of these components are not in the transit zone, then a transit line must connect it to another 'transit zone' that does have that component. A similar concept is shown in Portland's Streetcar System Concept Plan on page 21 as two mile diameter zones (Figure 2-h).

Walk Score® evaluates addresses, neighborhoods, or cities based upon their distance to amenities. The closer an amenity is to the address, the more points it is awarded. This thesis states that the specific site must have a walkability score between 40 and 70 according to Walk Score®, which would place the site between "car-dependent" and "somewhat walkable" depending on the score. The rating is based upon a scale of 0 to 100 with 100 being the highest walkability (Figure 2-i illustrates this). By using Walk Score® the site will be sure to satisfy the criteria that within the half mile radius site, that is the transit zone, there must be at least the following cultural necessities: one grocery store, two places of worship, a hair salon, five commercial buildings, a park, a school, three restaurants, and residential buildings.

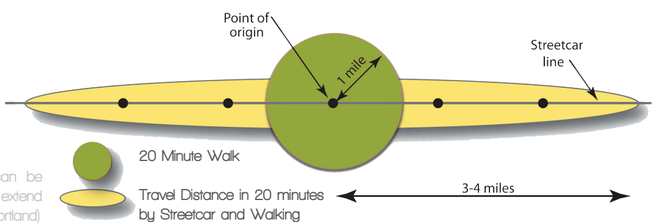


Figure 2.h The 20 minute neighborhood is the area that can be reached in 20 minutes or about a 1 mile walk. A streetcar can extend the pedestrian environment up to approximately 2 to 4 miles (Portland)

SITE INTRODUCTION

There are numerous site opportunities available when adapting transit systems to existing neighborhoods. The potential interaction with existing residents to collaborate on transportation options that fit their needs is one. Increasing generational interaction through designed transit hubs or bus shelters is another. A third opportunity is the ability to increase the frequency and availability of public transportation to people in the neighborhoods of the transit zone. Along with these opportunities come site challenges.

The most pressing site challenges are those associated with the changing seasons. Winter alone poses its own challenges in the Midwest. Snow and ice generally discourage people from walking outside or riding their bicycles to a bus stop or transit station. In Montreal, Canada there is an active transit system, which includes bicycle lanes, bus stops, and light rail systems (STM, 2013). To combat winter, Montreal has installed heated transit shelters, which is a possibility for Midwestern sites. Additionally, icy roads pose a threat to potential bicyclists riding in road bike lanes. Creating off street bike lanes or lanes separated from the roadways is a potential solution to icy roads in the winter and wet roads in the other seasons.

The most difficult aspect of the site will be incorporating a transit system throughout the neighborhoods that will connect pedestrians to other established transit zones. There is potential to integrate into the existing transit system infrastructure, but will require further examination to determine by what methods.

Walk Score®	Description
90-100	Walker's Paradise Daily errands do not require a car.
70-89	Very Walkable Most errands can be accomplished on foot.
50-69	Somewhat Walkable Some errands can be accomplished on foot.
25-49	Car-Dependent Most errands require a car.
0-24	Car Dependent Almost all errand require a car.

Figure 2.i

The primary users for the site will be Millennials, Baby Boomers, and future generations. To understand the difference between Baby Boomers and Millennials, a person must understand how technology has changed the values of Millennials and that the way Millennials think in their twenties is different than Baby Boomers in their twenties.

As each generation ages, they go through different life stages. In general people of each generation think similarly at each stage of their life. Children acquire values, young adults (21-41) test values, mid-lifers (42-62) apply values, and elders (63+) transfer values (Liotta, 2013). So why are current twenty-somethings, also known as Millennials, different than any other generation at that stage of their life? Technology.

Figure 2.j Baby Boomers

Figure 2.k Millennials

Figure 2.l Future Generations

USER | CLIENT DESCRIPTION

Advancements in technology have changed the way people think and value life. It has made information readily available at the touch of people's finger tips through mobile phone applications and the Internet. Millennials expect feedback instantaneously (Liotta, 2013).

With the advancement of technology has grown the understanding of global issues. Millennials, all 91 million of them, have grown up in an era of financial uncertainty and environmental concern. Thus resulting in a generation that not only thinks quickly, multi tasks easily, and communicates constantly, but Millennials "value community, welcome diversity, and crave a healthy work/life balance" (Broberg, 2010, p. 4). John McIlwain, senior resident fellow and J. Ronald Terwilliger chair for housing at the Urban Land Institute, believe that Millennials will do "more to lead the demand for smart growth" (Broberg, 2010, p. 4).

Smart growth is defined as the "planned economic and community development that attempts to curb urban sprawl and worsening environmental conditions" according to Google Dictionary ("smart growth"). It typically results in high density urban areas with multimodal transit, mixed-use zoning, and is generally more environmentally sustainable. Dutzik & Baxandall's A New Direction (2013, p.23-27) notes that Millennials express an overwhelming desire to live in a city where daily amenities and public transportation are within a walkable distance of their homes, an example of smart growth. As McIlwain believes, Millennials values appear to align with smart growth.

Baby Boomers, the 79.4 million of them, on the other hand grew up career-focused world. For the first time twenty-somethings were relocating to pursue a higher education or a career. Although they grew up during the Civil Rights Movement and Women's Movement, the Baby Boomers as a whole do not fully realize the goals of equality (Value, 2013).

Although Millennials were raised by Baby Boomers the traits of the two generations do not align. Baby Boomers believe that their work defines who they are, whereas Millennials believe their work is an expression of themselves (Value, 2013). Millennials also want a healthy balance between life and work; because they grew up watching their Baby Boomer parents overwork themselves and miss out on life's enjoyments.

Living in a transit zone provides an ideal environment for Millennials. They are connected to home, work, entertainment, and necessities without spending all their time driving. Aging Baby Boomers are also realizing these benefits and are moving to transit zones. These areas make travelling convenient and possible for Baby Boomers as they approach retirement. In AARP's Livable Communities (2005, p. 55), discontinuous and disjointed routes, traffic conflicts, poor design, and lack of maintenance are cited as challenges for pedestrians and why people do not walk. This project solves these issues by creating a transit zone with a complete streets approach that encourages pedestrian mobility within the zone and connects people to a larger transportation network.

CHAPTER 3: RESULTS & PROGRAMMING

RESULTS RELATED TO WALKABILITY, TECHNOLOGY & POLITICAL INTEREST IN LIVABILITY [&TRANSIT]

Results from Typology Research

The typology of this thesis summarizes the proven research that generational differences between Baby Boomers and Millennials exist. Differences related to communication and technological usages are clear. Millennials are technologically savvier than Baby Boomers. Their reliance on smartphones for communication and navigation are undeniable. Baby Boomers are starting to see the value in smartphones, but the typical level of usage is exponentially below that of a Millennial.

There are some similarities between the two generations. The desire to be within a walkable distance of daily amenities, such as grocery stores, is one common interest as well as the desire for more accessible transit options. These similarities are in support of transit-oriented, complete streets, and multimodal transportation development. Research shows that in order for transit related adaptations in established neighborhoods to be successful, all generational needs must be considered when designing.

Results from Research Questions

The research questions define the research that needs to be found. The three categories of walkability, technology, and political interest shaped the research into categories that directed the scope of this thesis. Through research each of the questions was answered. The following are the questions and a summary of the answers found through the research.

Walkability

1. What does a complete street mean and what does it look like?

A complete street addresses how pedestrians and vehicles move along a street. The relationship between the sidewalk and the pedestrian is just as important as the relationship between the car and the road. Multiple forms of transportation can be found on a complete street. Additionally, many complete streets address stormwater management in addition to the circulation needs.

2. How can walkability be quantified?

Research found that there are many ways to quantify walkability, but Walkscore® has developed an equation that calculates the number of amenities and their proximity to a specific location. This form of quantification is relatively accurate, but it does not take into account the condition of the path needed to traverse to the amenities. Thus, walkability must be a combination of amenities available and accessibility to residents.

3. What is transit-oriented development and what are its benefits?

Transit-oriented development is when transportation systems are designed with the Parallel Model of Transportation (see example on page 5, Figure 1.c). This means that in order to increase walking for example there needs to be improved walking conditions. The benefits of transit-oriented development are an overall improvement of the way people move from place to place. The more and more efficient options people have to move from point to point decreases travel time and increases health.

4. What are multimodal transit systems and what are its benefits?

Multimodal transit systems are networks of transit systems with multiple forms of transportation working together. Examples are found all around the country and world. An example is in Minneapolis, MN where there are bicycle, bus, light rail, and commuter train routes that function cohesively to make up the Metro Transit. Through research and experience the most developed multimodal transit systems are found in Europe where train lines have existed for over one hundred years.

The benefits of multimodal transit systems are very similar to transit-oriented development. There are health benefits when people use modes of transportation other than personal vehicles. This is primarily because people have to walk to public transit stops to take a bus or train to their desired location, or people may choose to bicycle to the location. Generally, public transit is less expensive than owning and commuting by a personal vehicle, which is an economic benefit.

5. How do different generations value walkability?

Each generation has developed different generalized characteristics and their value of public transportation and walkability is no different. Since the invention of the automobile there has been a trend to want to drive more and walk less. Driver's licenses have become a rite of passage into freedom (Dutzik, 2013). In 2008 the shift changed and there has been a steady decline in driving trends. Other research stated that Millennials are looking to move into cities that are walkable and accessible to a variety of amenities. Baby Boomers have also started to move back into cities for the convenience and accessibility to amenities as they age.

Technology

1. What types of mobile technology are used to make transportation more accessible?

Mobile phone applications (apps) for smartphones are the primary resource of mobile technology for making transportation more accessible. Apps like Google Maps and HopStop make planning a route home with a public transit system a cinch. Other bulkier mobile technology is a geographic positioning system (GPS), such as a Garmin or TomTom.

2. Which generations use mobile technology more and what types do they use?

The research shows that Millennials and future generations are using mobile technology more and more for everyday conveniences. Millennials typically use their smartphones as navigational devices, email, music players, gaming consoles, and phones. Baby Boomers in general are starting to adapt to mobile technologies, such as smartphones, but need to be taught how to use them to their full potential.

Advertising for apps has typically been targeted towards Millennials, but to increase the usage and number of users, there needs to be advertising directed towards Baby Boomers and older generations.

Political Interest in Livability [& Transit]

1. What public and private agencies support transit-oriented development, complete streets, and multimodal transit?

Research shows that various agencies support transit-oriented development, complete streets, and multimodal transit. Cities, counties, states, and the federal government support these types of development and policy implementation.

2. What forms of political interest are there?

Political interest develops in various forms and research has revealed that there is no right or wrong form. Each neighborhood, city, county, etc. chooses and implements a form specific to their site. Some forms are public policy documents, 10 year plans, and community development groups, such as the Nokomis East Neighborhood Association.

3. What levels of government have influence on neighborhood transit development?

From the local neighborhood associations to the city transit authorities to the state departments of transportation and all the way to the federal department of transportation have influences on transit development. Depending on the type of transit being done each government level will have more or less influence on the project.

4. Who implements transit-oriented development, complete streets, and multimodal transit?

Research states that typically city, state, and federal transit departments implement transit-oriented development, complete streets, and multimodal transit because these implementations are large scale and require more authority than the typical neighborhood association.

5. What are examples of future goals related to transportation?

Through research multiple case studies were found on transportation development projects. The City of Charlotte, North Carolina implemented a Transportation Action Plan in 2011 that outlines their transportation goals for the next 25 years (City, 2011). Another example is in Minneapolis, Minnesota where the city implemented ACCESS, a ten year transportation action plan to improve the streets, sidewalks, bicycle paths, and overall transit system for pedestrians over the next ten years (City, 2008). Other examples were looked at, but these correlated closest with the research criteria.

Each of the research questions and their results formed the prognosis of this thesis. The research leads the thesis to discuss the importance of walkability to Millennials and Baby Boomers, while also addressing the potential of technology in relation to transportation. Political interest is essential to develop the ideas of complete streets, transit-oriented development, and multimodal transit into a reality.

Results from Criteria

The criteria are distributed amongst three categories of research: walkability, technology, and political interest. Walkability research consists of five primary components and subsequent research: complete street implementation, quantifying proximity to amenities to a location (Walkscore®), transit-oriented development, multimodal transit systems, and generational values of walkability. Technology research consists of three aspects: history of technology, generational use of technology, and applications of technology within public transit. The third research category, political interest is focused on policy development, implementation, future goals related to transit-oriented development, complete streets, and multimodal transit.

The categories simplify the major research points for site selection. After the criteria have narrowed the site selection pool, criteria are prioritized to meet the needs and wants of the client. By prioritizing the criteria with the client, design solutions are refined into site specific solutions from the general thesis question, hypothesis, and research questions.

The criteria guide the thesis's research to understand and discover the solution to the hypothesis. As research is completed new questions arise and more information is needed to be found. Researching tends to have a snowball effect, but the criteria guide the research to maintain its path to discover the most important aspects key to answering the thesis question, proving the hypothesis, and answering subsequent research questions.

In the design phase, criteria may be further narrowed leading to more research questions that are site specific. Another option that may occur in the next phase is that, information may lead to realization that the criteria are unnecessary or inappropriate to the site specific design.

Results from Literature Reviews

The literature reviews support each category of the criteria: walkability, technology, and political interest. The walkability literature review discusses the importance of proximity of amenities and public transit to Millennials and aging Baby Boomers. It also discusses the value of complete streets, multimodal transit, and transit-oriented development to create an overall walkable neighborhood, affectionately referred to as a transit zone. Walkability encourages Millennials and Baby Boomers to be residents of a neighborhood. The technology literature review discusses the history and benefits associated with technology when paired with transportation. Millennials are more apt to use apps and mobile technology to make travelling easier and more accessible for themselves when compared to older generations. The third literature review on political interest in livability and transit discusses the undeniable role politics plays in the implementation of transit policies. Without the support of political voices and public policy, it is nearly impossible for residents to have their values transferred from ideas to reality. Political interest is necessary to the increase in livability and transportation options available in neighborhoods.

Through the literature reviews information and research is discovered that solidifies the availability of multi-modal transit and complete streets as a growing need amongst the Millennial generation and aging Baby Boomers. Additionally economic, health, and community benefits develop out of these types of neighborhood improvements. Finally there are many forms in which walkability, technology, and political interest can come in, and it is the specific site that defines that unique form.

Results from Research Methods

By using the pragmatic research approach, research collection was done through a variety of sources: databases, geographic information systems, books, and the Internet. Information has been found in support of complete streets approaches to transit-oriented development. The research proves that Millennials value transit-oriented development and that cities that are lacking these types of development are not increasing their Millennial populations as quickly as other cities, such as New York, NY that have established these types of transit systems. These findings help cities retain Millennial residents, thus stabilizing populations. The data and results are limited to available information and are subjective to projection results.

Methodology for conducting this research narrowed walkability, technology, and political interest in livability and transit data to determine the specific city and neighborhood where the example site application of a transit zone is for this thesis, which will be developed in the design phase.

As research was conducted, variances on approaches to walkability and multimodal transit systems were found. This broadened the options and applicable implementation plans for the design phase. Additionally, research led to a greater understanding of the influence policy can have on transportation. The more public interest and politician support, the more effective and complete a public policy improvement document is.

Results from Case Study

Charlotte, North Carolina has worked with for decades on their transit system to create an interconnected system that serves riders as well as communities. Political interest in livability and transit are the backbone of Charlotte's transit system. Without the support of the City of Charlotte and the surrounding towns, TAP would not have been formulated and subsequent funding would not have been received from local sales tax, state, and federal funding.

Furthermore, the use of mobile apps to make routing the multimodal transit easily accessible is very effective as a Millennial noted (Schwartz, 2013). This adds to the walkability of the system as transit-oriented development is built in the transit zones that surround each transit stop.

Each of these elements is important to this thesis, but the lesson that Charlotte's experience touches on is that transit-oriented development does not always come easily. Many residents resisted it out of fear of affordable housing, but when community interest was shown through design, fears were alleviated. Finally, it is notable that transportation action plans or policy is necessary for transit-oriented development to occur.

Results from User | Client Research

Each site's specific clients will vary slightly depending on the location, but generally the clients will be the residents of the neighborhood the site is located on. The primary clients will be the Millennials, Baby Boomers, and future generations as they value transit-oriented development more than any other generation at this time.

Walkability is extremely important to Millennials as they choose places to live and start having families. Being in close proximity to daily amenities and connections to a larger transportation network is a key determining factor. Between the ages of 18 and 34, Millennials are setting the stage for how they plan to raise the next generation. Baby Boomers moved out of cities and into suburbs when they were the same age as Millennials are now, but as they age Baby Boomers are seeing the benefits of living close to amenities. Accessibility and walkability are becoming more important. Between the Millennials and the Baby Boomers, they account for approximately 170 million people in the United States, so their values and needs should be a high priority of cities.

Cities must start adopting policies that support the livability and transit systems. These policies indicate to residents that the city cares about their residents' values and needs. Many cities have started to adopt complete street policies, ten or twenty-five year transit plans, and/or re-zoning policies that increase the walkability and accessibility of neighborhoods.

Technology is another factor that must be addressed when looking at the users of the site. With each generation technology becomes more and more integrated into daily life. Technology can make public transit more accessible through apps, but in order for them to be successful the apps need to be easy to use.

Through the user | client description this thesis exhibits that walkability, technology, and political interest in livability and transit are important to Millennials and Baby Boomers. The more a city can improve its neighborhoods based on the values and the needs of these generations, the more people will move into and care about the neighborhoods.

Complete street approaches to transit-oriented development can be seen through various lenses. The information and results of this thesis are applicable to the fields of history, design, politics, transportation, engineering, sociology, and cultural anthropology. The historical, political, and design contexts are illustrated here as they are the most relevant.

Historical Context

Historically, public transit projects have been implemented to increase the ease with which people move from point to point. Between the middle of the 19th century and the middle of the 20th century industrialized cities built and operated streetcar rails, trolleys, and carriage routes to increase the viability of public transportation (Minnesota). With the invention of the automobile people began to be dissatisfied with public transit (Charles, 1999). Bad business practices and a search for profit led to the death of early rail and trolley lines (Charles, 1999).

Today, cities are working to rebuild public transit routes, but it is different than it was a hundred years ago. Labor and material costs are greater and regulations are stricter. Additionally, there are more existing structures to work around, which pose challenges to designers. The benefits of structures are their way of forming the transit system. A designer can see what points are currently drawing large amounts of people and plan to have transit lines connect to those points. Structural barriers can drive construction costs up as well though, which can influence the scale of the project. These pros and cons can make adapting and implementing transit policies and systems seem challenging to address.

Recently, the United States High Speed Rail Association (USHSRA) developed a plan that would connect major cities across the United States by electricity powered 220 mile per hour high speed rail lines (HSR) by 2030 (2013). The backbone of this project is to connect HSR Express lines to existing city transit systems (United, 2013). USHSRA suggests that this will be built in four phases (United, 2013). The first phase is to be completed by 2015 and would connect the regional and local rail systems together (see Appendix C). The second phase is to be completed by 2020, the third by 2025, and the final phase by 2030 (Appendix C) (United, 2013). These phases were determined by the ten mega-region forms that the Regional Plan Association has studied (United, 2013).

USHSRA's plan is the future of the United States' transit network. By connecting cities across the country by rail lines public transit usage will increase. Public health and livability increases in relation to availability of public transit (AARP, 2005). The plan does not come cheap though. Implementing this HSR plan will cost about $500 billion, but will also connect 80 percent of Americans (United, 2013). Additionally, HSR will create $19 billion in new business per year and 150,000 new jobs (United, 2013). What the United States does with its transit systems over the next two decades will set the precedent for the future of the United States, economically, politically, and socially.

APPLICABLE VALUES FOR SITE & RESEARCH

RESULTS & PROGRAMMING

Transit-oriented development as discussed in this thesis deals at the micro-level of projects such as this. Projects that apply the criteria of this thesis are the backbone, as mentioned above, of HSR systems. Without connections at the local level to bus and light rail systems, cities cannot expect to be able to integrate easily into the overall system when built.

Political Context

Politics play a major role in the implementation of complete street transit-oriented development. How politicians and government agencies view and value a topic, effects the importance and effort they put into improving that topic. Over the past decade the federal, state, and local governments and agencies have become increasingly concerned with the environmental impacts of automobiles. Studies on automobile environmental impacts, such as vehicle miles travelled per person in U.S. Prig's report, Moving Off the Road, are conducted to create proof in support or against the environmental impacts of personal motorized vehicles (Blaxandall, 2013). This thesis similarly compiles information that may be presented to public officials to increase the awareness of alternatives to improve public transit options, which in turn reduces the number of cars on the road and their environmental impact.

Recently government agencies have started to see the value in improving transit systems at the local level. City's such as Portland, Oregon; Charlotte, North Carolina; and Minneapolis, Minnesota have adopted transportation action plans for the next ten to twenty-five years (City, 2008; City, 2011; Portland, 2009). In Portland feasibility studies have shown policy makers that by developing transit zones or 20 minute neighborhoods, it increases the use of public transit usage; increases the density of the neighborhood; and improves the health of the community (Portland, 2009). In Charlotte the Transportation Action Plan is helping to guide the development of new transit options in the city (City, 2011). Over the past decade Charlotte's population has swelled to over 800,000 and their existing infrastructure cannot handle it (City, 2011). By increasing their public transit and the accessibility of public transit through mobile applications, Charlotte is able to continue growing with a sustainable transit network (City, 2011). The City of Minneapolis adopted ACCESS a ten year plan that started in 2008 to increase the frequency and types of transportation available.

Additionally, at the federal level there have been some policy adaptations as well. The creation of the U.S. DOT's Transportation for a New Generation document and Livability in Transportation Guidebook the federal government demonstrates the importance of public transit options and livability of cities in society. Improvements in technology are increasing the feasibility and accessibility of public transit. This thesis is concerned with informing politicians, residents, and designers alike about how integrating a complete streets approach to transit-oriented development to established neighborhoods can increase the use of public transit.

Design Context

Landscape architects, urban planners, architects, engineers, et cetera are all charged to design in the interest of public health, safety, and welfare. New design concepts and approaches are developed daily to work towards these goals. Complete streets and transit-oriented development are two that have come to light in recent years.

A complete street design approach looks at addressing the needs of all users of a street as well as the ecological needs of the street, i.e. stormwater management (Smart, 2010). Cities across the country are looking at ways to incorporate these policies more effectively. In Minnesota the Minnesota Complete Streets Peer Exchange compiled a report Getting Results: Complete Streets in Minnesota, which lists pointers and ways in which cities in Minnesota are working on incorporating complete streets (McCann, 2012). Many cities create opportunities to implement complete streets as projects and maintenance comes up (McCann, 2012).

Transit-oriented development is another approach that designers are using. It focuses on ¬¬designing with the Parallel Model of Transportation, concluding that in order for there to be an increase in transit usage there must be an improvement in the transit conditions (see example on page 5, Figure 1-c). Additionally, transit-oriented development only works when there are amenities located near the transit stops (Portland, 2009). Therefore it is imperative that residential buildings co-exist with restaurants and commercial buildings in order for a neighborhood to sustain a transit system.

Form based codes | zoning is a newer zoning style that allows mixed use buildings to exist and encourages transit-oriented development. Rezoning is sometimes necessary to develop a transit-oriented neighborhood. This can be a difficult task for any city and can cause setbacks. Established neighborhoods built before or during the first half of the 20th century, typically include a scattered set of commercial buildings within a largely residential neighborhood. These neighborhoods do not have the standard zoning issues as an urban core, which may make it easier to design and adapt a transit-oriented development to them.

The thesis's research discusses the potential of combining the two concepts of complete streets and transit-oriented development together to develop guidelines for creating an even more complete approach to transit projects.

There are a number of applicable fields that can evaluate and value the research of complete street approaches to transit-oriented development. Information and results found in this thesis are applicable to the fields of history, design, politics, transportation, engineering, sociology, and cultural anthropology. The historical, design, and political contexts were illustrated here as they are the most relevant to this thesis and its example design application in chapter five.

The research design is cyclical. The problem is identified, a thesis is framed, and a hypothesis is formulated as described previously in Chapter 2: Research Questions. Then data is collected using research methods. Data is analyzed and, if needed, more research is conducted. After the data is analyzed, design concepts are proposed. Further research is conducted and analyzed to determine the final design concept. The conclusion of the project is a design solution to the problem that was identified in the beginning. This is illustrated in Figure 3-a. Further research is completed to understand the specific site.

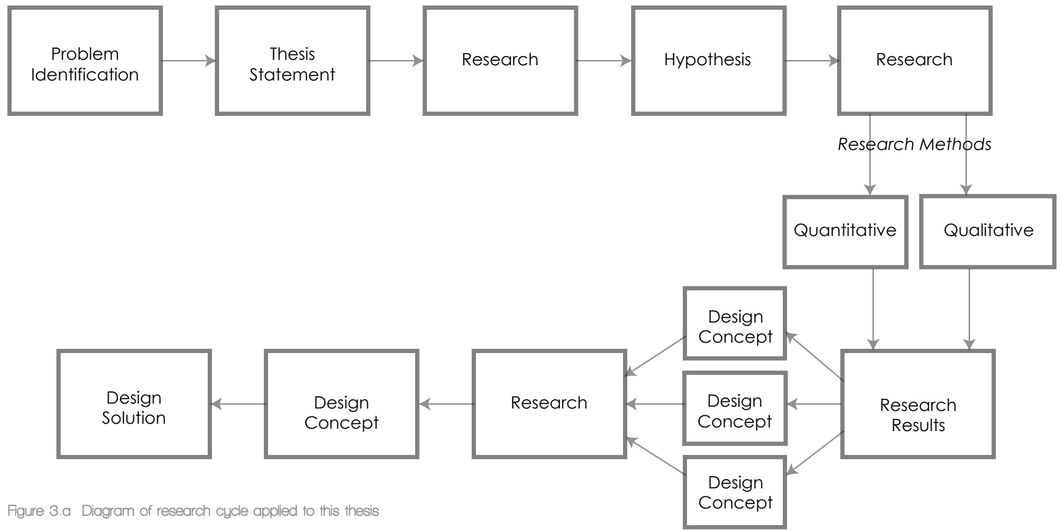


Figure 3.a Diagram of research cycle applied to this thesis

During the fall semester of 2013 I researched walkability, technology's relation to transportation, and political interest in livability and transit. I read websites, research articles, and books to understand each of these topics and the generational relationship to each one. From there I wrote this thesis and created graphics for this thesis. Through the use of the criteria and research I chose a site in southeast Minneapolis, Minnesota to apply my thesis to during the spring semester of 2014.

In preparation for the spring semester, I visited my site and took visual and auditory inventory of the site. I documented the site thoroughly with digital images that are geographically tagged, which makes creating a visual inventory and walk through of my first site visit on Google Earth possible. I also made a contact with the Nokomis East Neighborhood Association in preparation of further understanding the needs of the neighborhood.

m	tu	w	th	f	s	s
august 26	27	28	29 write summary of thesis proposal 2 hrs	30 due: paragraph summary of thesis proposal	31	september 1
2 labor day	3	4	5	6 research 6 hrs	7 read research 6 hrs	8 write 8 hrs
9 due: statement of intent | abstract | booklet layout 1,000 words	10	11 williston, nd LA 571 class trip	12 →	13 →	14	15
16 research 2 hrs	17	18 research 2 hrs	19	20 research 2 hrs	21	22
23 research 2 hrs	24	25 research 2 hrs	26	27 research 2 hrs	28	29

m	tu	w	th	f	s	s
30 center for writers meeting 30 min	october 1	2	3	4	5 read research 8 hrs	6 write 12 hrs
7 due: chap. 1-2 3,000 words	8	9 minneapolis, fargo, boston, philadelphia, or portland for site	10 narrow site to minneapolis, fargo, boston or philadelphia for site	11 narrow site to minneapolis, fargo, boston or philadelphia for site	12	13
14	15	16 chose minneapolis for site	17	18 apply criteria to chosen site 5 hrs	19 apply criteria to chosen site 3 hrs	20 site visit: minneapolis, mn 2 hrs
21 site visit: minneapolis, mn 2 hrs	22	23 edit chap. 1-2 5 hrs	24 center for writers meeting 30 min	25	26	27
28 create work schedule 2 hrs	29	30	31 halloween	november 1	2	3
4	5 center for writers meeting 30 min edit paper 6 hrs	6 due: chap. 1-3 10,000 words	7	8	9	10
11 no class	12	13	14 asla national meeting & expo →	15 →	16 →	17 →
18 asla national meeting & expo	19	20	21	22	23	24
25	26	27	28 thanksgiving	29 no class	30	december 1 writing & reorganizing booklet 10 hrs
2 writing 6 hrs	3	4 writing & graphic editing 10 hrs	5 center for writers meeting 30 min	6	7	8 writing 14 hrs
9 writing 14 hrs	10 center for writers meeting 30 min writing 14 hrs	11 due: chap. 1-5 20,000 words	12	13	14	15
16 dead week → finals week	17 →	18 →	19 →	20 →	21	22

Figure 3.b Fall work schedule

During the spring semester of 2014, I intend to expand on my existing inventory of Nokomis East neighborhood through another site visit and meeting with the Nokomis East Neighborhood Association. After inventory is complete, I intend to analyze the information. From that point I will develop a thesis program that focuses on a complete streets approach to adapting the existing street structure and transit system to be transit-oriented and develop a more complete multimodal transportation system that operates on the site. After the program is complete design elements and an overall design for the Nokomis East neighborhood will be created. At the end of spring semester I will have a complete example of how implementing the concepts of this thesis onto a physical site can occur.

m	tu	w	th	f	s	s
january 13	14	15	16	17 site visit	18 site visit	19 site visit
20 no class martin luther king day	21	22	23	24	25	26
27	28	29	30	31	february 1	2
3	4	5	6	7	8	9
10 due: site analysis & initial ideas	11	12	13	14 valentine's day	15 site visit	16 site visit
17 no class president's day	18	19	20	21	22	23
24	25	26	27	28	March 1	2
3	4	5	6	7	8	9
10	11	12	13	14 due: schematic plans & programmatic elements	15 spring break →	16 →
17 spring break st. patrick's day →	18 →	19 →	20 →	21 →	22 →	23 →
24	25	26	27	28	29	30
31	april 1	2	3	4	5	6

Figure 3.c Spring work schedule

m	tu	w	th	f	s	s
7	8	9	10	11	12	13
14	15	16	17	18 no class →	19 →	20 → easter
21 no class	22	23	24	25 digital thesis boards due	26	27
28 physical thesis boards due by 8am	29	30	may 1	2 final presentation	3	4
5 dead week →	6 →	7 →	8 →	9 final thesis documents due	10	11
12 finals week →	13 →	14 →	15 →	16 →	17 10am commencement	18

DESIGN GOALS

After completing the research for this thesis theoretical, physical, and social goals must be set to focus the design phase of this thesis. Below are the goals:

Theoretical

The theory behind this thesis adds to the knowledge of the fields of landscape architecture, transportation and logistics, engineering, and planning on how to approach the process of adapting existing transit networks. This thesis lays out criteria for cities to evaluate and understand if the current transit system is meeting the needs of Millennials, Baby Boomers, and/or future generations, specifically in the Midwest, but the essentials of the criteria can be applied anywhere.

Through this thesis my individual design philosophy has been formulated. I view landscape architecture as a mode in which I can develop and adapt transportation systems to influence the needs of people every day. Through applying the design values of landscape architecture, I can design transit networks that are fluid, cohesive, and environmentally sustainable.

Physical:

This thesis will create dialogue within the Nokomis East neighborhood that could lead to implementation of a complete streets approach to transit-oriented development. Through developing a complete streets approach within this neighborhood, it can become a case study for the rest of Minneapolis and other projects that apply a complete street approach to transit-oriented development.

There have been many adaptations of a variety of transit systems throughout the country, but this thesis looks at how a set of criteria can help evaluate the potential a city has at developing individual sites into transit zones. This is especially important in cities of 100,000 to 500,000 residents where in recent history large scale transit systems have seemed unfeasible due to population size and density. The idea that transit systems through transit zones creates a nodal transit system that can be adopted by any city at any size because it is based on a node one mile in diameter. Thus planning transit starts to look like a pearl necklace. The string is the transit system/lines that link each pearl (transit zone) together.

Social

This thesis aims to create social harmony amongst a neighborhood through social interaction and increasing residential health by implementing elements that encourage public transit usage through walkability, technology, and political interest in livability and transit. People are more likely to interact and talk about what is happening in their neighborhood if they are walking or bicycling to a destination than driving. Additionally, by walking or bicycling, people are increasing their health and well-being.

Through implementation of this thesis connections can be made within the community. People that would not normally interact will have the opportunity to interact at transit hubs or stops if seating, bicycle racks, or cafes are incorporated into the site.

As the thesis has developed, so have the intentions I have for my future design practices. I intend to look at the current and future social benefits of my design work as I am designing. I do not want to design just to create something beautiful, but to create something beautiful, effective, helpful, and smart. Landscape architecture has the potential to influence people every single day and as a future landscape architect, I aim to design for greatest influence of good and not the greatest profit.

RESULTS & PROGRAMMING

CHAPTER 4: DISCUSSION

APPLYING TRANSIT ORIENTED DEVELOPMENT & COMPLETE STREETS

Throughout research there are challenges and opportunities that progress and limit the development of this thesis. The thesis is that cities in the Midwest, with populations of 100,000 to 500,000, must transform their neighborhoods into transit zones that emphasize a complete streets approach and connect to a larger transportation system in order to entice Millennials and Baby Boomers to remain residents. The hypothesis for this thesis is that if neighborhood x, in city y (in the Midwest) adopts a complete streets program for the transit zone – half-mile radius from the center of neighborhood x and develops a multimodal, complete streets, transit-oriented development through that area, then Millennials and Baby Boomers will move into the transit zone. Research conducted supports the hypothesis that Millennials and Baby Boomers want to live near amenities in a walkable community (Broberg, 2010, p. 4). Portland, Oregon's Streetcar System Concept Plan states that "20-Minute Neighborhoods," also known as transit zones "promote an environment where one can walk, bike or take transit to essential amenities in 20 minutes" (2009, p. 21). The concept looked at in this thesis was closer to a 10 minute walk or a half mile radius from a transit hub. Research addresses the walkability, technology, and political interest in livability and transit for the concepts of complete streets and transit-oriented development.

When researching transit-oriented development walkability, technology, and political interest play important roles. Transit-oriented development is established as a transportation system that is focused around how people can move from point to point on and around a site with different types of transportation. The focus is not on just the individual's automobile, but on sidewalk connectivity, bicycle routes, bus routes, and rail systems.

Walkability addresses the connectivity and potential of the site. This thesis's research defines a site's walkability by Walk Score®, which calculates the quantity and proximity of a site to surrounding amenities (Walk, 2013). A challenge with this form of evaluation is that the distance is measured by aerial route, not the physical route a person takes. Research shows that walkability is not only the proximity to amenities, but the quality of the path taken to reach them (McCann, 2009). Elements such as wider sidewalks with boulevards separating the sidewalk from the street create a sense of safety and invite pedestrians to walk (McCann, 2009). Including wide bicycle lanes or separating them from the road entirely entices users. Lighting can also encourage walkability. People are more likely to walk down a lit street at night than a dark one. Additionally, the type and direction of lighting used in a landscape can create a sense of security along a pathway (City, 2008). If lights are pointed in the wrong direction they can blind a person, creating a sense of danger. In contrast, lighting can illuminate a person's whole figure when installed correctly, providing a sense of safety.

OPPORTUNITIES & CHALLENGES OF OUTCOMES & RESEARCH

DISCUSSION

Technology is proven to increase the accessibility of transit to all generations. By incorporating real-time reader boards at bus stops, pedestrians do not have to plan their routes ahead of time. Also the use of apps on smartphones and other mobile devices makes planning trips with public transit easier (Schwartz, 2013). Apps that incorporate multiple modes of transit are the most effective in routing information. When bicycle, bus, and train routes are interconnected, the more options and quicker the routes to get from point to point are available. Millennials rely on technology for route information, while Baby Boomers are just starting to understand the concepts and benefits of apps (Liotta, 2012).

Political interest in transit-oriented development is integral for its success. Without political support, such as Mayor Bloomberg's support of mass transit in NYC, or the support of other politicians to introduce ten or twenty-five year plans on improving the transit systems in a city, transit-oriented development would be extremely difficult to adapt into the infrastructure of a city. Minneapolis, Minnesota has implemented ACCESS, a ten year plan for increasing the completeness of the street infrastructure and increasing the number of transit options available to pedestrians (City, 2008). The City of Charlotte, North Carolina also implemented a Transportation Action Plan in 2011 that sets guidelines and goals for the next twenty-five years on how to improve their transit system (City, 2011).

As iterated, this thesis's research finds that transit-oriented development has three major components: walkability, technology, and political interest in livability and transit. The research also addresses the concept of complete streets. A complete street reflects the relationship between the different transit systems, as well as how the ecology and stormwater of the site integrate into those systems creating a unified design that is effective for pedestrians using any type of transportation (foot, bicycle, car, bus, etc.) (McCann, 2009). Walkability, technology, and political interest in livability and transit come together in a complete streets approach. No longer do elements stand alone, but they intertwine with all of the surroundings. This is the greatest challenge of this thesis; to create complete streets design that interlaces the elements to make a holistic design.

APPLICATION OF RESULTS WITH RESEARCH

The results of this research are that Millennials and aging Baby Boomers value the accessibility of transit-oriented development. When approached with a complete streets concept, transit development encompasses all aspects of a design. It creates a holistic approach to transit-oriented developments.

The results of this thesis create an outline for landscape architects to follow when looking to adapt existing transit networks into transit-oriented developments. The design application in Chapter 5 exhibits potential design solutions that designers, planners, and engineers can look to as examples of combining a complete streets approach with transit-oriented development.

Specifically, design elements that this thesis's resulting research has proven to be integral to the design phase of this thesis are listed in the following section by category.

OUTCOMES APPLICABLE TO SITE CONCEPT & ELEMENTS

The research determines outcomes that are applicable to sites in concept. In this thesis research falls into three categories, walkability, technology, and political interest in livability and transit, each category has specific elements that research determines to be important to the design of a complete streets approach to transit-oriented development. Each element that is described below is a conceptual element to be detailed out specific to a final site in the design phase.

Walkability

Circulation Hierarchy

Current conditions of a majority of roadways within the Midwest exhibit a hierarchy of vehicular travel above all others as illustrated in Figure 4-a. In a complete streets approach to transit-oriented development a shift in circulation hierarchy towards pedestrians as shown in Figure 4-b must occur.

Way Finding

Clear and consistent signage creates navigable routes, whether they are bus, bicycle, or walking routes. Without proper signage transit systems become difficult to navigate, which leads to low usage. By creating implementing a transit-oriented development, cities are typically trying to reduce the confusion and increase the usage of public transit networks.

Shelter elements

Shelters are to be located throughout the transit zone, not just at the central point. Shelters should be built and placed to protect riders from the wind during any season and heating elements should be installed to combat the cold weather and rain of the Midwest. Way finding elements should be incorporated into the bus shelter as well. Each transit zone should have unique designs to designate the different neighborhoods in a large transit network.

Lighting

Lighting elements create a sense of security and character of a transit zone. Lighting should illuminate people's faces without causing a blinding effect near transit stops. Installations near amenities, bicycle racks, and along residential streets should be at a pedestrian scale. Large overhead street lights create a flood of light in no particular direction. Pedestrian scale lights (about 13 feet tall) direct the light towards a specific area, illuminating only what needs to be in order for a person to feel safe walking or bicycling alone at night. Color of light can also affect how safe a neighborhood feels. Different colors filter plants, people, and materials differently, so lighting color should also be considered when designing the site.

Bicycle Elements

Bicycling is important to incorporate into cities. It is a clean energy that encourages healthy lifestyles. By adding just one mile of bicycle lane to an existing roadway, bicycle ridership can increase by at least one percent. That is 10 new riders and 10 less drivers out of 1,000 people. In the Midwest, there are many ways to implement bicycle lanes. The easiest way is to re-stripe the roadways. Another way is to use the right-of-way land that is the boulevard and create a bicycle lane that is separated from the roadway. A third way, is to create a parkway down the center of the road for bicycle and pedestrian traffic. How bicycle lanes are implemented depends upon the site and the resources available to the city.

Incorporating bicycle parking is important to encourage people to ride instead of drive to amenities and transit stops. Bicycle racks are an inexpensive and impactful solution. Storage lockers are optional element that may be implemented into a design if a city believes it is necessary. Typically, storage lockers are located at light rail stations where people bicycle to the train, leave their bicycle all day, then ride their bicycle home from the train. Bicycle share programs are another option element to consider. Dependent upon further research a city may determine if it is the right choice for their site. Bicycle share programs have costly start-up fees, but have the potential to increase ridership drastically.

Plant Material

Street design is not complete without the installation of vegetation. Vegetation should strategically designed into the plan as a sensory device that creates an enjoyable experience as one travels along the sidewalk as well as the on the road in a bus, on a bicycle, or on a train. Depending on the United States Department of Agriculture (UDSA) hardiness zone the site is located in the vegetation will vary. The character of a transit zone will determine the plantings as well as will support the character of the neighborhood.

OUTCOMES APPLICABLE TO SITE CONCEPT & ELEMENTS

Technology

Mobile Technology Applications

As previously mentioned and research has shown that mobile technology has the ability to increase the accessibility of transit routes. Navigation apps on smartphones use real-time transit route information to determine the quickest route from point to point. Increasing the availability of an app that provides specific real-time data of a city's transit system is vital to the accessibility of transit systems. Research proves that transit apps need to include all forms of transit available to be successful.

Reader Boards

Real-time reader boards should be installed next to or within the bus shelters to inform riders when and which bus will next arrive. Real-time information is important to Millennials as they want access to current information now (Liotta, 2012).

Political Interest in Livability [& Transit]

Policy Document

Political interest in livability and transit are important to the successful adaptation of any transit system, let alone a complete streets approach to transit-oriented development. Cities that already have a plan to improve their transit system are one step ahead. Cities that do not have a plan in place need to create a plan and/or set of goals for the next ten to twenty-five years on how to improve their transit network. Individual site specific decisions will be made as to what exactly is included in that policy. Residents, neighborhood associations, politicians, landscape architects, city planners, engineers, and transportation analysts should be included in formulating the policy document.

DISCUSSION

CHAPTER 5: SITE INTRODUCTION, INVENTORY & INFORMATION

AN INTRODUCTION TO NOKOMIS EAST NEIGHBORHOOD

Minneapolis, Minnesota is where the example application of this thesis will be applied. Hidden in Plain Sight by the Center for Transit-Oriented Development (September 2004), depicts on page # in Figure 2-b, how the West North Central section of the Midwest has only three metropolitan areas with transit, one of which is Minneapolis-St. Paul, MN, who are newly starting to develop their system. By looking at Minneapolis as a site, examples can be drawn from to how to integrate into a developing system as well as a non-existing one due to the locations specific site. The specific site was narrowed down by the criteria previously mentioned in chapter one.

The specific site is located in southeastern Minneapolis, Minnesota. Keewaydin, Minnehaha, Morris Park, and Wenonah are the neighborhoods located within the site that make up the Nokomis East Neighborhood. The neighborhood's intersection at the intersection of 54th Street East and 34th Avenue South is the central point for the transit zone; the half mile radius circle that is the site (Figure 2-a).

Minneapolis' population is 392,880 with a density of 7,157 people per square mile, a high density compared to the rest of the United States (City, 2013). Since 2000, Minneapolis' population has increased from 382,618 people, a 2.8 percent increase. Nokomis East's total population is 14,416 with 28 percent being between the ages of 18 and 34. The average age of residents in Minneapolis has maintained at 31 years old throughout the past decade. Thus, Minneapolis appears to attract Millennials, people between the age of 20 and 34 (see Figure 2-c for population break down). Nokomis East's specific median age is 34 years old.

The average travel time to work on the site is about 25 minutes. Seventy percent of people in Minneapolis drive to work alone, while 25 percent walked, bicycled, or rode the bus (City, 2013). With a low commute time there is potential to replace individual car commute time to work with public transit commute options that would take the same amount or less time.

The site has a grocery store, many restaurants, four churches, three schools, and many other commercial buildings (see Site Inventory for more information). The site has all the characteristics of a successful transit zones zone, except the transit. Walk Score® evaluated this neighborhood as "somewhat walkable" with a Walk Score of 62, a Bike Score of 61, and a Transit Score of 58. According to the thesis the site meets the walkability criteria.

Minneapolis, Minnesota as a whole, which includes Nokomis East neighborhood, has political interest in the livability and transit system. Minneapolis has implemented ACCESS, a ten year transportation improvement plan (City, 2008). This shows that Minneapolis is vested in the quality of life of its citizens. It also demonstrates that ideas and plans for adaptations to existing transit infrastructure are being welcomed.

There are areas that need to be improved in the Nokomis East neighborhood to meet the criteria of this thesis, such as increasing areas where people of all ages can interact near transit. Cafes, benches, tables, and shelters create a sense of community and the ability to increase personal interaction. Nokomis East is currently lacking these components, but the design phase of the application will improve this criteria. These components are political dreams because they build community support, which increases how people care for their neighborhood and the transit usage.

The technology criteria are met, but are lacking in accessibility. Currently, there are only four free apps that show up when "Minneapolis Transit" is searched. An additional app for $0.99 is available. Three of the apps have a majority of negative reviews and all the apps available have reviews that suggest a person needs to be experienced with the public transit system in Minneapolis to understand it. This leads the technology to be inaccessible for a majority of people, which means improvements are needed in design phase of the thesis application.

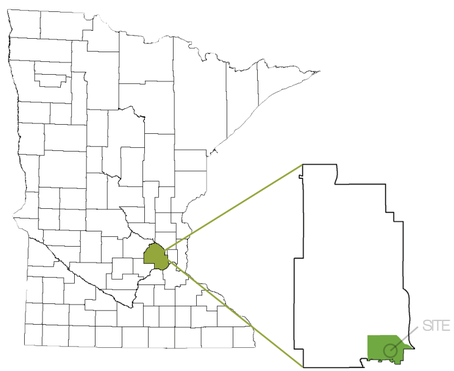


Figure 5.a . Site Context Map . The site is ~~located in Hennepinn~~ County Minnesota, in the Nokomis East neighborhood of Minneapolis

There are several site opportunities available when adapting transit systems to Nokomis East neighborhood. The potential interaction with existing residents through the Nokomis East Neighborhood Association to collaborate on transportation options that fit their needs is one. Increasing generational interaction through designed transit hubs or bus shelters is another. A third opportunity is the ability to increase the frequency andavailability of public transportation to people in the neighborhoods of Keewaydin, Minnehaha, Morris Park, and Wenonah. Along with these opportunities come site challenges.

The most pressing site challenges are those associated with the changing seasons. Winter alone poses its own challenges. Snow and ice generally discourage people from walking outside or riding their bicycles to a bus stop or transit station. Installing heated transit shelters is a potential design solution. Additionally, icy roads pose a threat to bicyclists riding in road bike lanes in Minneapolis. A potential solution is to design off street bike lanes or lanes separated from the roadways. The most difficult aspect of the site will be incorporating a transit system throughout the Minneapolis neighborhoods that will connect pedestrians to other established transit zones. There is potential to integrate into the existing light rail infrastructure, but will require further examination in the design phase to determine by what methods.

Before 1900, Nokomis East was a major American Indian Center and until 1880 an American Indian Village was located just north of Lake Nokomis, Northwest of the site boundaries (Nokomis). Three of the four neighborhoods that make up Nokomis East neighborhood have American Indian inspired names: Wenonah, Minnehaha, and Keewaydin. Minnehaha and Keewaydin are derived from Ojibwe meaning "laughing waters" and "northwest wind" respectively (Live).

In 1872 St. Paul City Ry opened its first line of horse drawn streetcars (horsecars) (Minnesota). Horsecars were horse-drawn buses on rails, which minimized the bouncing that occurred over cobblestones. With horse-powered operations came complications of waste disposal, number of horses needed keep a single car in service all day (seven/car), and horses are able to contract a disease (Minnesota). Between 1879 and 1891, different forms of energy were tested to power the trains: steam, underground cable, and electric; Electric appeared the most feasible and sustainable. Minneapolis and St. Paul's transit systems were merged in 1891 to form the Twin City Rapid Transit. The last track was added in 1947 and at its peak the company operated 524 miles of track (Minnesota).

In 1921 Motor buses appeared on the transit scene, restricted to services on suburban routes, "expresses, and short shuttles from the ends of the streetcar lines" (Minnesota). After 1938, buses started to replace streetcars on full service city routes and between 1940 and 1949 ridership increased from nine percent to twenty-three percent.

In November of 1949 a group of outside investors took control of the Lowry Corporation. Due to the high cost of maintaining its tracks and overhead power system, streetcars were more expensive to run that buses. It was cheaper for the company to scrap the cars and infrastructure and substitute a lesser services, so they did that. Ridership dropped significantly and in 1954 it was down to 86million compared to five years earlier at 165million. The streetcar era had been killed in Minneapolis and St. Paul (Minnesota). The success of the Twin City Rapid Transit was largely due to the consistency of ownership by Thomas Lowry and family until 1931 and Lowry Corporate until 1970 when Metropolitan Transit Commission (government agency) purchased it.

Between the 1920s and 1960s housing boomed in the area because of the availability of streetcar routes and rail lines (Nokomis). Keewaydin, Minnehaha and Morris Park neighborhoods primary building period was prior to 1940 with the exception of the blocks south of East 50th Street, north of East 52nd Street, east of 34th Avenue South and West of 39th Avenue South, which was primarily built up during the 1960s (City). Wenonah neighborhood experienced their building boom between 1940s and 1950s (City). Many houses on the site have been renovated since they have been built, while 1,580 homes have been built or torn down and rebuilt new between 1970 and today.

In June 2004 Metro Transit opened the Hiawatha Line, a light rail system operating from the Mall of America in Bloomington, to the Metrodome in downtown Minneapolis, and operating along Hiawatha Avenue just four blocks east of the site (Figure 5-b). In November 2008 the Hiawatha Line expanded to Target field with a total of nineteen stations (Figure 5-c). In July 2011 the Hiawatha Line was renamed the Blue Line with the proposal and implementation of light rail expansion to St. Paul and throughout Minneapolis.

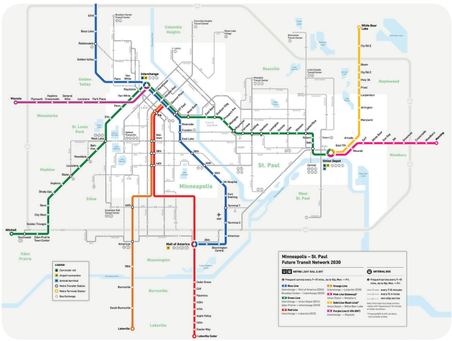


Figure 5.c Minneapolis | St Paul transit Map of all existing and proposed lines for 2030

Figure 5.b 50th Street Station of the Hiawatha Line located just four blocks east of the site

Nokomis East Neighborhood Association (NENA) is a "thirty-three year-old nonprofit volunteer organization whose goals are to promote neighborhood improvement and revitalization, and encourage citizen participation in civic affairs" (Nokomis). NENA is compiled of members of Keewaydin, Minnehaha, Morris Park, and Wenonah neighborhoods and has a Planning and Development Committee, Housing Task Force, and an Environmental Task Force. Both task forces are inactive as of December 2012. The Planning and Development Committee promotes programs such as commercial façade, streetscape, and bicycle path improvements. To keep the residents and businesses current on events held in the community, NENA's website has a calendar, which is updated multiple times during the week.

The Nokomis East neighborhood is compiled of Keewaydin, Minnehaha, Morris Park, and Wenonah neighborhoods. The following are graphics of the age demographics of the area by specific neighborhood and the overall percentage for Nokomis East Neighborhood (includes all four neighborhoods).

Since 28 percent of people living within Nokomis East are Millennials (18-34 year olds), there is a need to meet the values of those residents.

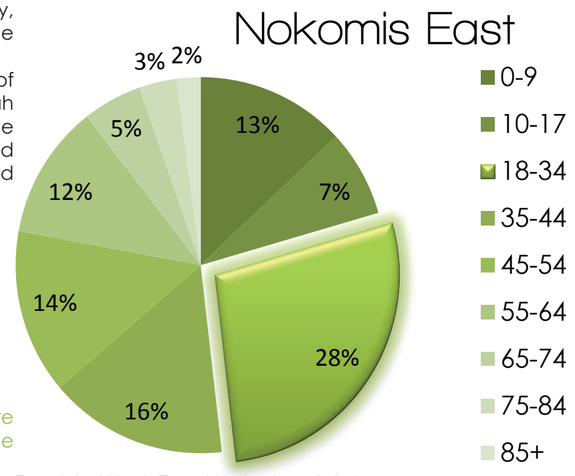


Figure 5.d.1 Nokomis East neighborhood age distribution

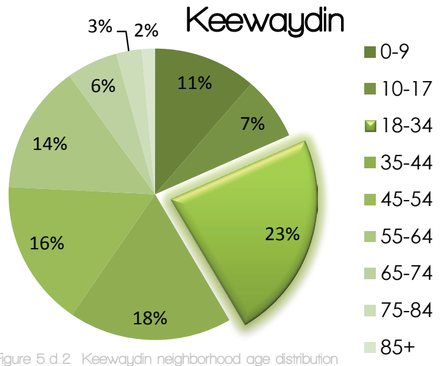


Figure 5.d.2 Keewaydin neighborhood age distribution

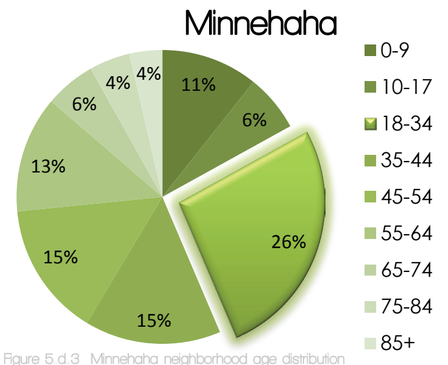


Figure 5.d.3 Minnehaha neighborhood age distribution

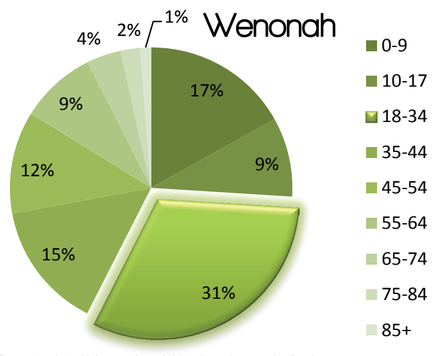


Figure 5.d.4 Wenonah neighborhood age distribution

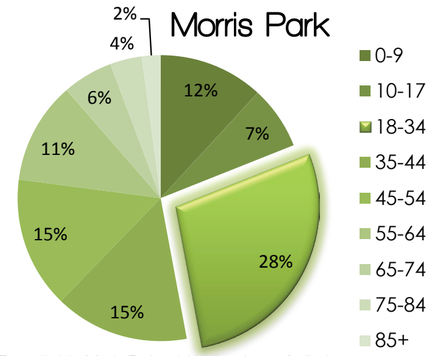


Figure 5.d.5 Morris Park neighborhood age distribution

Natural Processes – humidity, sunshine, cloudy days, snowfall, wind, precipitation, and average temp – see Figure 5-e-1-4 (City, 2013).

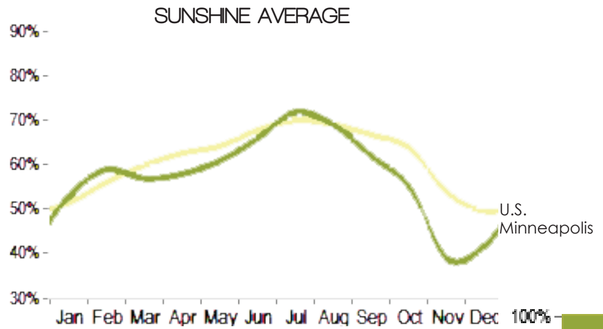


Figure 5.e.1 Sunshine average in July is about 70 percent of the time while in November it is only about 35 percent of the time (City, 2013)

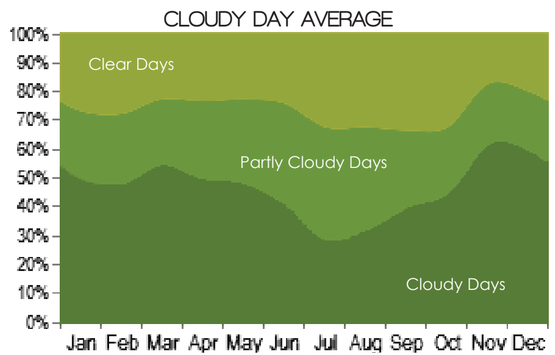


Figure 5.e.2 July through mid.October has the clearest percentage of days, while November and December are the cloudiest months (City, 2013)

During the summer months temperatures can reach upwards of 106*F, which can lead to roads buckling. In the winter temperatures can reach below 0*F. These extreme freeze thaw cycles need to be considered within the design.

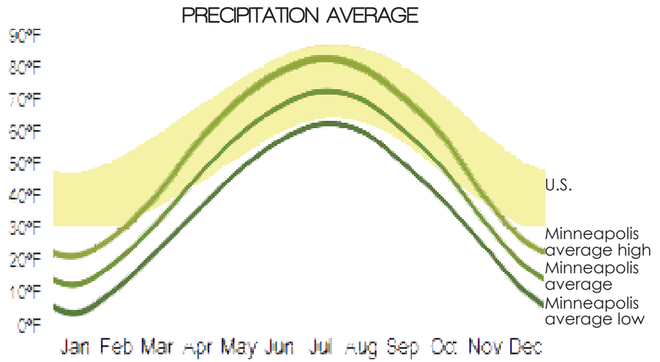


Figure 5.e.3 July through mid.October has the clearest percentage of days, while November and December are the cloudiest months (City, 2013)

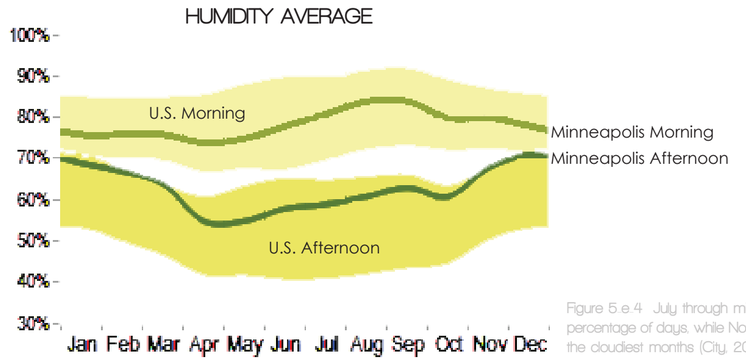


Figure 5.e.4 July through mid.October has the clearest percentage of days, while November and December are the cloudiest months (City, 2013)

Natural Processes – Temperature, wind speeds, precipitation, and snowfall averages. – see Figure 5-e-5-8 (City, 2013).

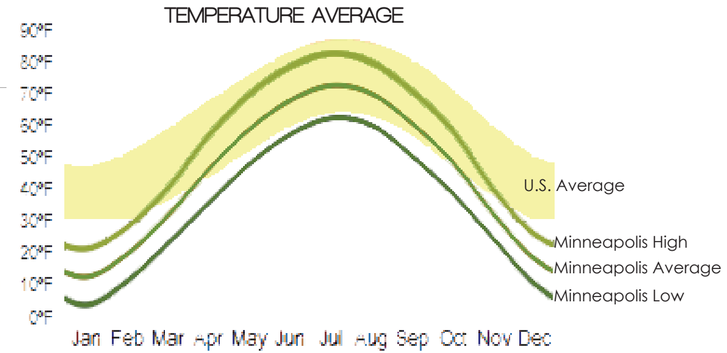


Figure 5.e.5 The average temperatures follow the US average. The warmest month is July, with January being the coldest month (City, 2013)

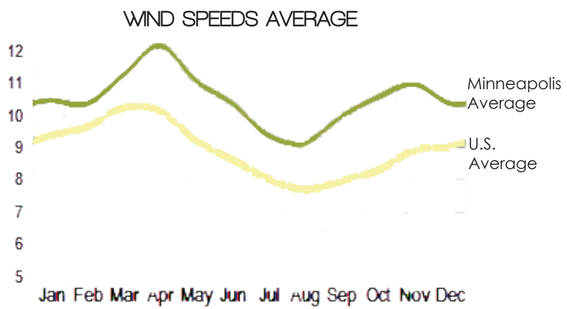
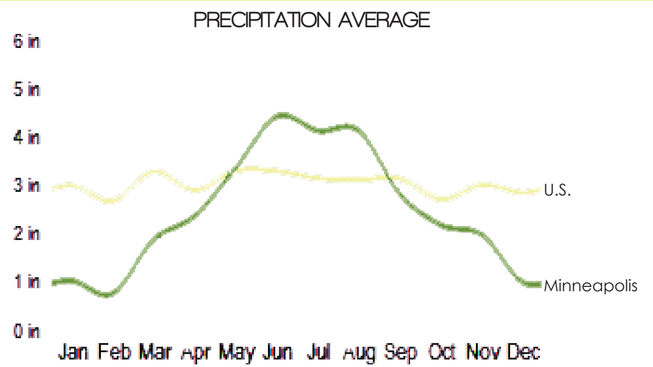


Figure 5.e.6 The average wind speeds are above US average all year long. The windiest month in Minneapolis is April with 12+MPH winds on average (City, 2013)



Due to the location of the site, the site has seasonal weather issues. In the winter snowfall accumulates with an average of 11 inches per month (City, 2013). Chances of freezing rain can occur as well. During the spring, summer, and fall it rains, which can cause flooding in the poorly drained areas of the site.

Figure 5.e.7 The average precipitation is about 4.5 inches between the months of May and August (City, 2013)

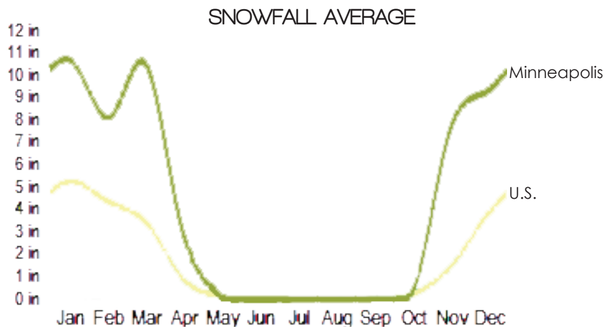


Figure 5.e.8 The average snowfall is around 11 inches in January and late March (City, 2013)

Figure 5.g Plant Materials
The site has primarily turf lawns and boulevards with elms, ashes, and a few scattered maples as boulevard trees

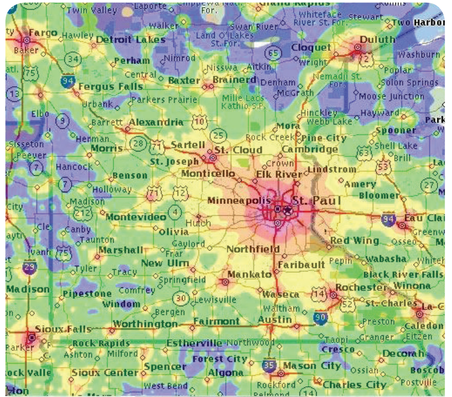


Figure 5.h Minneapolis has extreme light pollution

Figure 5.i Existing lighting along Nokomis Parkway at night illuminates a broad area instead of directing light where it is needed

Figure 5.j.1
Morris Park

Figure 5.j.2
Residential Street Light

Figure 5.j.3
Morris Park

Figure 5.j.4
Nokomis Parkway

Each of the above lighting figures illustrates the different lighting scales and figures existing on the site. A lack in consistency of the style and format, emotes a lack of sense of place on the site.

Figure 5-j-1 at Morris Park emits a lot of excess light at night because it is not directed light and has no hood.

Figure 5-j-2 is a typical residential street light. It is about 30 feet tall and illuminates a large area in an orange hue. The fixture is hood to prevent some light pollution, but due to its height it is ineffective.

Figure 5-j-3 at Morris Park is a standardized field light and can be found at any of the other parks on the site. The light is only on when the park is being used for soccer or softball games. The structure is tall and overpowering to the site. When on, the light illuminates the entire neighborhood and creates a large amount of light pollution.

Figure 5-j-4 illustrates the lighting fixtures along Nokomis Parkway. This is technically off the site, but tying into nearby lighting styles in the same neighborhood helps define the sense of place. This lighting structure is hooded, but does not shield the light very well from emitting in all directions as in Figure 5-x. The light is a brighter-white compared to the standard orange halogen light.

Building Materials
1. Brick, variety
2. Cement
3. Wood, vinyl, and steel siding
4. Stucco

A majority of the homes were built between “1920 and 1960 and are designed as bungalows, mini-tudors, tudors, with occasional one-story ranch styles (Live). “Nokomis East neighborhood developed before others due to the availability of streetcar routes and rail lines” in the early part of the century (Nokomis).

Figure 5.k.1 Typical house

Figure 5.k.2 Typical house

Figure 5.k.3 Typical apartment complex

Figure 5.k.4 Steves Mobil Station

Figure 5.k.5 Al Vento - restaurant

Businesses on Site

Churches
1. Faith Evangelical Lutheran Church
2. Lake Nokomis Lutheran Church
3. Crosstown Covenant Church
4. St. Herman's Orthodox Church

Schools
1. Minneapolis Academy – charter school 5-8
2. Hiawatha Leadership Academy – charter school K-7
3. Lake Nokomis Community School – K-8 – used to be Keewaydin Elementary School K-5, but combined with Wenonah Elementary and expanded with a ribbon cutting on October 12, 2013.
    - Wenonah Campus – K-2
    - Keewaydin Campus – 3-8

Government
1. Minneapolis Fire Department Station Number 12, government
2. U.S. Post Office, private/government
3. Nokomis Library, government

Restaurants
1. Dominguez
2. Pizza Hut
3. Pizza Joe's
4. Singapore
5. 3 Tiers Bakery Bistro
6. Al Vento
7. Town Hall Lanes, bar and bowling alley
8. Nokomis Grill
9. Las Teresitas
10. Di Noko's Pizzeria

Figure 5.I.1 Lake Nokomis Community School | Keewaydin Campus

Figure 5.I.2 Town Hall Lanes

Figure 5.I.3 SuperAmerica

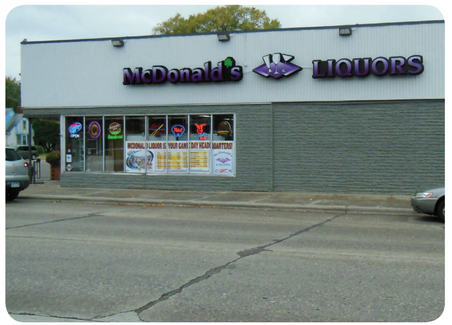


Figure 5.I.4 McDonalds Liquor Store

Commercial
1. Room 34 Creative Services, web development
2. Wells Fargo
3. US Bank
4. Oxendales Market
5. Nokomis Market
6. Kate's Tailor Shop
7. Nokomis Hardware
8. EHS Hospitality
9. Curves
10. Brushed Monkey: Painters, Plasterers, Decorators, and Artists
11. SuperAmerica
12. Steve's Mobil
13. Crosstown Gas and Convenience
14. Michaelson Precision Auto Repair – no longer in business
15. Auto Care, Inc.
16. Keewaydin Auto Sales
17. McDonald's Liquor Store
18. Nokomis Shoe Shop
19. Nokomis Martial Arts
20. Village Hair
21. Bob's Barber Shop
22. Shear Magic Hair styles Beauty Salon
23. Hestness Accounting
24. Dwight C. Demaine, D.D.S
25. Nokomis Square Cooperative 55+ Senior Living Community
26. TJ's Coin Wash
27. Denise & Stacey's Pet Grooming
28. Book Trader and Curiosity Shop
29. Hiawatha Cleaners
30. Kopplin Law Offices¬

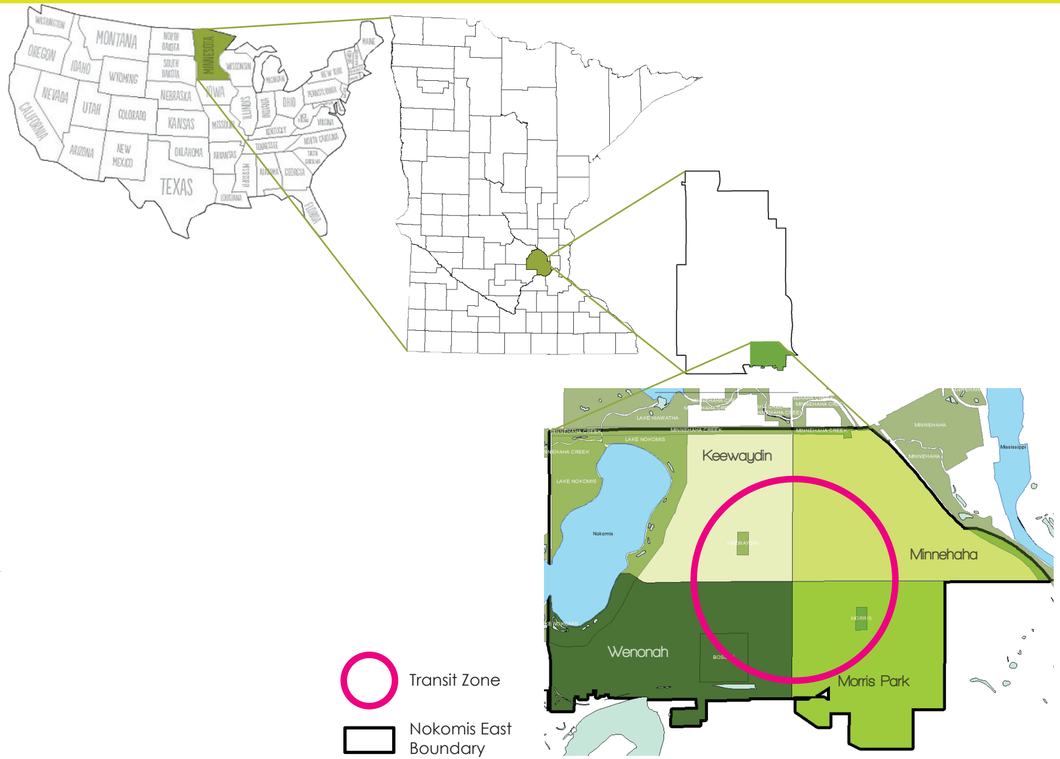


Figure 5.m Site Context

Figure 5.n Mass & Void Analysis

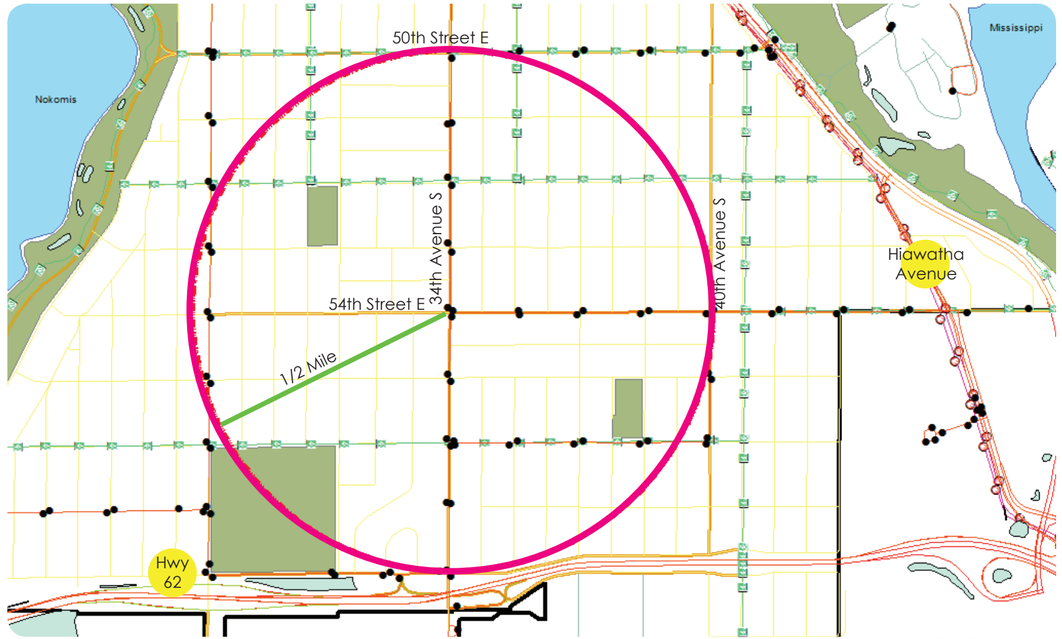


Figure 5.o Circulation

Figure 5.p.1 Typical Roadway Material

Figure 5.p.2 Typical Boulevard Material

Pervious & Impervious

Pavement is primarily impervious. Roadways throughout the site are concrete with asphalt filling in any holes or cracks. Sidewalks are typically concrete, but coloring varies depending on when it was poured and by whom.

Boulevards are typically pervious areas of turf, crushed rock, or pavers. The size and width of the boulevard vary from residence to residence. The maintenance of the boulevard varies as well.

Overall, the site has about seventy-five percent pervious area from the residential housing and parks. Only about twenty-five percent of the site is impervious, which is primarily roads and sidewalks (this is an estimate).

Figure 5.p.3 Crushed Rock Boulevard Material

Parking

Parking is available on streets unless posted otherwise. Exceptions are during snow events, when snow plows need to drive down the streets; and fall and spring street cleaning days, which are posted on temporary signage the week prior to the event.

Figure 5.q.1 Typical Parking Signage near Schools

Figure 5.q.2 Typical Parking Signage

Utilities & Infrastructure

The majority of utilities are located in alleys. Some electrical poles are located on sidewalks, but that is typically near an intersection.

Figure 5.r Typical Utilities are found in the Alleys

Figure 5.s.1 Keewaydin Park

Figure 5.s.2 Morris Park

Figure 5.s.3 Bossen Park

Neighborhood Parks

Keewaydin Park
1. Playground
2. Softball Field
3. Basketball Court
4. Soccer Field
5. Picnic Area
6. Public Pool
7. Community Center Building
8. Restrooms
9. Drink Fountain

Morris Park
1. 2-Playgrounds
2. Public Pool
3. Skate Park
4. Soccer Field
5. Softball Field
6. Community Center Building
7. Restrooms
8. Drinking Fountain

Bossen Park
1. Baseball Field with stadium seating
2. 9-Softball Fields
3. 2-Playgrounds
4. Basketball Court
5. Soccer Field
6. Public Pool
7. Restrooms
8. Drinking Fountain

Throughout this thesis research shows that each generation is unique from another, but value systems may cross. As Baby Boomers age they begin to see the value in accessibility through connectivity to amenities and technology, creating a sense of urban draw. In contrast, Millennials are entering into the realm of adulthood, and strongly value the connectivity and accessibility that a transit zone provides. Research clarifies that transit zones are a feasible design solution to complete street transit-oriented development planning. Transit zones create nodal systems that can be built upon, eventually creating a fully linked system. This has massive ramifications for the design field. A common myth has been that in order for multimodal transit systems to be sustainable, a certain population, usually over 500,000 people and a very high population density must occur in a city. Instead transit systems are integrated at a small scale that fits into an overall large scale transit systems across a city. Each node, transit zone, is self-sustaining with its walkable elements of groceries, education, worship, and commercial amenities. It is a re-invented way of thinking about transit planning and zoning. Repercussions may be felt in zoning departments as an increase in mixed use zoning should occur in typically residential neighborhoods. As well as in engineering departments as bicycle lanes and transit lines may become a standard in incorporation in roadways.

In landscape architecture this thesis lays out criteria for Midwestern cities to determine the feasibility of adapting existing transit systems into complete street transit-oriented developed systems. The design application provides an example of the potential design elements that may be incorporated in a city's transportation adaptation.

Nokomis East neighborhood provides the opportunity to show examples of complete restructuring of a transit system as well as how to integrate a transit zone into a larger transit system. With standardized roadway elements Nokomis East is a typical Midwestern neighborhood that was established in the 1940s-60s.

Current conditions, as iterated in the Site Inventory, are minimal at best. Modes of transportation are to be presented as inviting and feasible to encourage public transit usage. As the parallel model of transportation depicts, improving sidewalks, bicycle routes, and bus routes increase walking, bicycling, and bus ridership respectively.

Sidewalks run along all edges of every street in the Nokomis East neighborhood. Each block varies on sidewalk and boulevard width. Through standardizing sidewalks and boulevards, pedestrians may be encouraged to walk more. This will increase the health of the neighborhood as well.

Bicycle routes run through the site, but are not well defined. By defining the bicycle routes through signage, separate lanes, bicycle racks, and navigation apps, bicycling will be established in the transit zone as a feasible mode of transportation.

There are 47 bus stops in the transit zone of Nokomis East neighborhood. Only one has a shelter, of which it is not heated or fully enclosed. Additionally, none of the shelters are conducive to a gathering space. The current bus stops are uninviting and uninformative as to bus schedules. Implementing real-time reader boards as New York, Portland, Boston, and many other cities have done, bus routes will be more accessible to people of all generations. Bus stops have the potential to become transit hubs. Locating transit hubs near cafes and installing patio areas with movable furniture may provide areas for community interaction.

Lighting throughout Nokomis East neighborhood is currently halogen lighting that emits an orange haze across all of the surfaces. The lighting also is primarily through street lights that are about thirty feet tall and not directed. With current technology lighting can be switched to an LED style and color that is warm, but still white light. The lighting structures of the secondary roads can be switched out to pedestrian height lighting (thirteen feet tall) and spaced more frequently to provide directed light. This practice of lighting also reduces the amount of light pollution. Another newer feature of lighting technology is the ability to dim lighting on a timer. All of these methods can reduce the light pollution in Nokomis East and increase the feeling of safety along the sidewalks and streets.

The research that supports this thesis developed the criteria categorized under walkability, technology, and political interest in livability and transit. Each of those categories helped narrow and define the site to be Nokomis East neighborhood. When applying the research of this thesis to the site design individual though is given to each design element. The location, material, size, and potential influences on the neighborhood are all thought of.

In moving onto the application phase of this thesis – the design – will focus around results of the research on a complete streets approach to transit-oriented development. Lessons learned throughout this thesis will be applied to the design through the above mentioned elements and others. As Alan Lakein once wrote, "Planning is bringing the future into the present so that you can do something about it now." The aim of this thesis application is to prove that landscape architecture, when paired with transportation, can create a complete street approach to designing a transit-oriented adaptation to an existing neighborhood that will sustain current and future generations. This thesis provides designers with an example application as well as a list of criteria that help determine if a site is suitable for transit-oriented development. Foremost, the research supports that through the development of complete street transit-oriented development, design can influence the social harmony of a place.

CHAPTER 6: DESIGN APPLICATION

ADAPTATION | TRANSFORMING EXISTING TRANSIT SYSTEMS FOR MILLENNIALS | A COMPLETE STREETS APPROACH TO TRANSIT ORIENTED DEVELOPMENT IN MINNEAPOLIS, MN

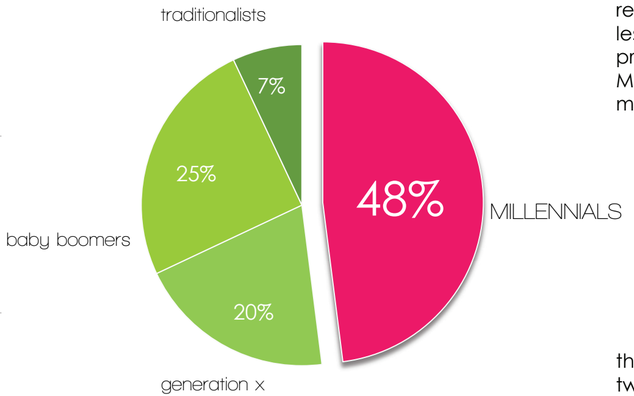


Figure 6a Nokomis East Neighborhood Demographics

The first step in understanding the importance of adapting transit systems is to understand the change in demographic needs over time. Millennials are people born between 1983 and 2000 and through the above research I have discovered that Millennials are less dependent on personal vehicles than any previous generation. Additionally, I found that Millennials want to live in neighborhoods that maintain a strong sense of:

- circulation hierarchy
- wayfinding elements
- pedestrian shelters
- bicycle elements
- pedestrian lighting
- environmentally conscious efforts
- mobile technology apps that increase the accessibility to transit
- digital reader boards and bus routes

These elements can be found throughout the transit zones and I have divided them into two categories: walkability and technology, as illustrated in Figure 6.b.

Currently in the Nokomis East Neighborhood, 48% of the residents are Millennials or younger generations that share similar values to Millennials (Figure 6.a).

WALKABILITY
within a 10min. walk to amenities

- circulation hierarchy
- wayfinding elements
- shelter elements
- bicycle elements
- lighting elements
- bioswale plants

TECHNOLOGY
electronic devices that make life easier than any previous generation

- mobile technology apps
- reader boards

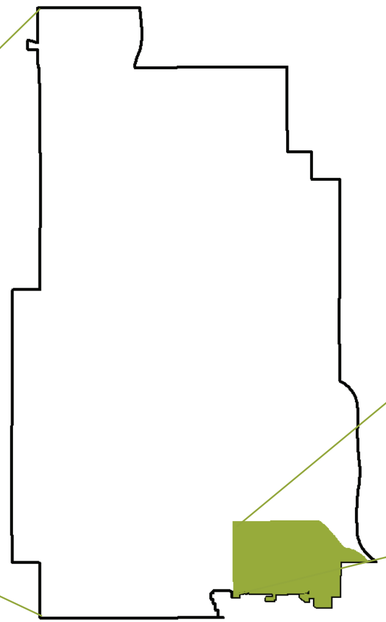
Figure 6b Transit Zone Elements Important to Millennials

The site I have chosen is located in southeast Minneapolis in the Nokomis East Neighborhood, which is the confluence of the four neighborhoods or Keewaydin, Minnehaha, Wenonah, and Morris Park. The site's central intersection is at 54th Street E and 34th Avenue S.

To understand why I chose my site, we need to look at the existing Minneapolis Transit system that I will be adapting.

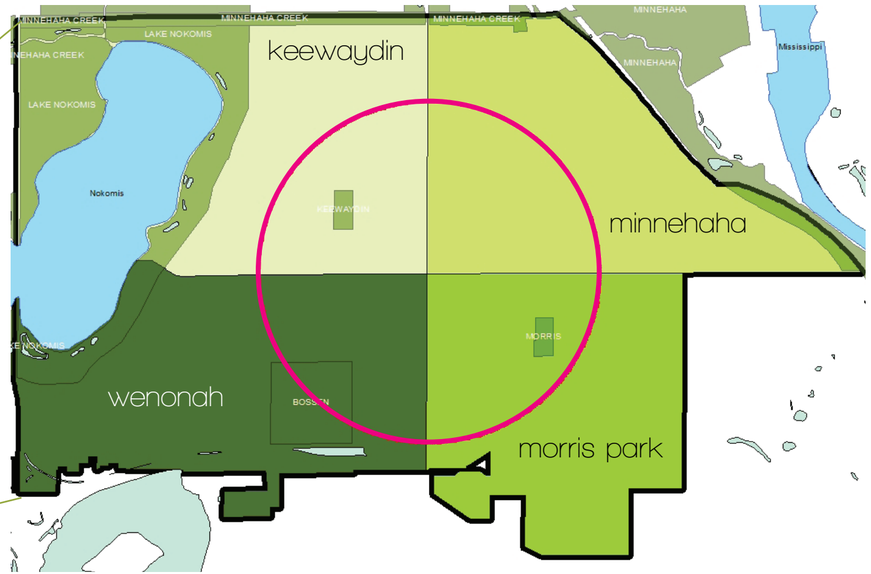
MINNESOTA
hennepin county

HENNEPIN COUNTY
minneapolis



MINNEAPOLIS
nokomis east neighborhood

NOKOMIS EAST NEIGHBORHOOD
keewaydin | minnehaha | wenonah | morris park



SITE

Figure 6.c Site Context

The Existing system includes a high frequency light rail system, a few high frequency bus routes, many low frequency bus routes, and an intricate bicycle route system that connects to the many lakes found in Minneapolis (Figure 6.d).

EXISTING TRANSIT

- light rail system
- bus routes | high & low frequency
- bicycle routes

light rail

existing bus route

existing low frequency bus stop

existing high frequency bus stop

bicycle route

COMPONENTS PRESENT:

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

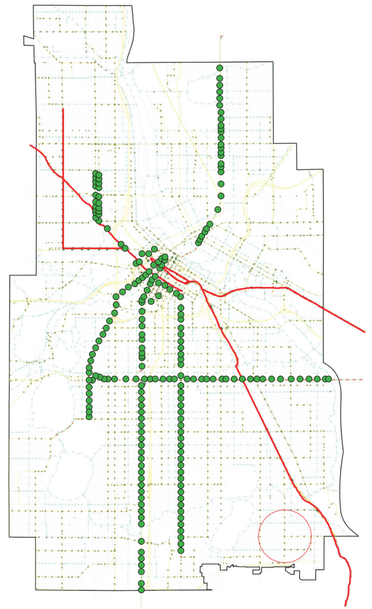


Figure 6d Existing Minneapolis Transit System

To increase the efficiency of the transit system I propose reducing the number of bus stops by applying the concept of transit oriented development. This concept applies a half mile radius around a central transit stop, so that any one person only has to walk at most a ten minutes or a half mile to access a high frequency transit stop. These stops are then located 1 mile apart. By reducing the number of stops a bus takes, it increases the frequency at which they can arrive at any given stop along the route.

TRANSIT ADAPTATION

modifying the existing transit system to fit the needs and values of current and future residents

proposed transit zone for light rail

proposed transit zone for existing high frequency bus routes

proposed transit zone for new high frequency bus routes

site - transit zone

COMPONENTS PRESENT:

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

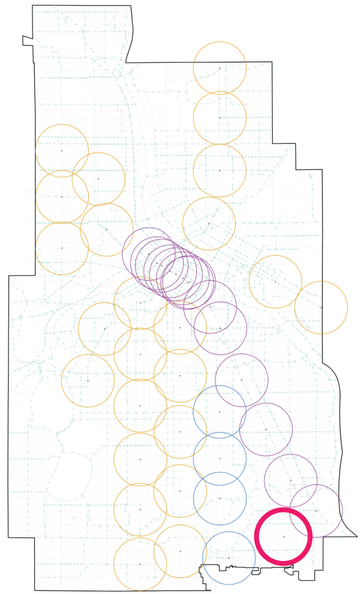


Figure 6e Adapted Minneapolis Transit System

After reducing the number of transit stops based on density and existing transit stop location, I classified the transit zones into Type A, which includes a commercial corridor,and Type B, which is primarily residential. Each type was strategically located, so that there is at most one and a half miles or a fifteen minute bus ride between each Type A transit zone.

I chose to develop the transit zone for the Nokomis East Neighborhood, because it is currently the least connected neighborhood to high frequency public transit in Minneapolis. Additionally, 48 percent of the population are Millennials.

CLASS A TRANSIT ZONE

primary transit zone | contains a commercial corridor

CLASS B TRANSIT ZONE

secondary transit zone | primarily residential

- class A transit zone
- class B transit zone
- site - class A transit zone

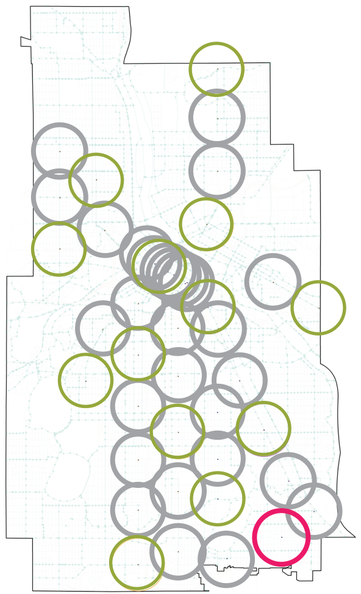


Figure 6f Classified Minneapolis Transit System

COMPONENTS PRESENT:

WALKABILITY

within a 10min walk to amenities

TECHNOLOGY

electronic devices that make life easier

EXISTING | site intersections

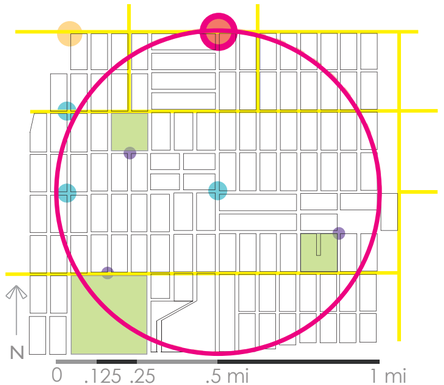


Figure 6g Existing Nokomis East Intersection Hierarchy

The site currently is lacking the intersection organization to support a transit zone. By categorizing the intersections into landmark, gateway, collector, and residential intersections, I was able to discern where and what elements were present on the site. Landmark intersections are where there is a confluence of transit and commercial corridors. Gateway intersections are entrances to the neighborhood. Collector intersections gather people along collector roads and draw them into a neighborhood. Finally, residential intersections immerse people within the culture of the neighborhood. The existing site intersection diagram illustrates the current intersection typology layout within and surrounding the Nokomis East Neighborhood.

landmark
confluence of transit & commercial corridors

gateway
entrance to neighborhood

collector
gathers people along collector roads

residential
immersion within the neighborhood

designated bicycle route
on-street connection

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

PROPOSED | site intersections

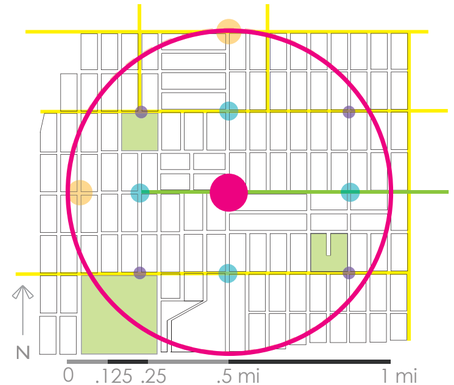


Figure 6h Proposed Nokomis East Intersection Hierarchy

By reorganizing the intersection hierarchy, to place the landmark intersection in the center of the transit zone, I have created a central transit hub and commercial intersection that draws millennials into the neighborhood. I also relocated where the other intersection typologies should be and how the greenway would intersect with the parkways to the east, north, and west of the transit zone.

I chose to design the landmark intersection only in detail because all the elements that are located within the other intersections are detailed out in the landmark intersection at some level. The components can then be applied to each intersection respectively to their level of necessity.

landmark
confluence of transit & commercial corridors

gateway
entrance to neighborhood

collector
gathers people along collector roads

residential
immersion within the neighborhood

greenway
safely connecting people & spaces

designated bicycle route
on-street connection

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

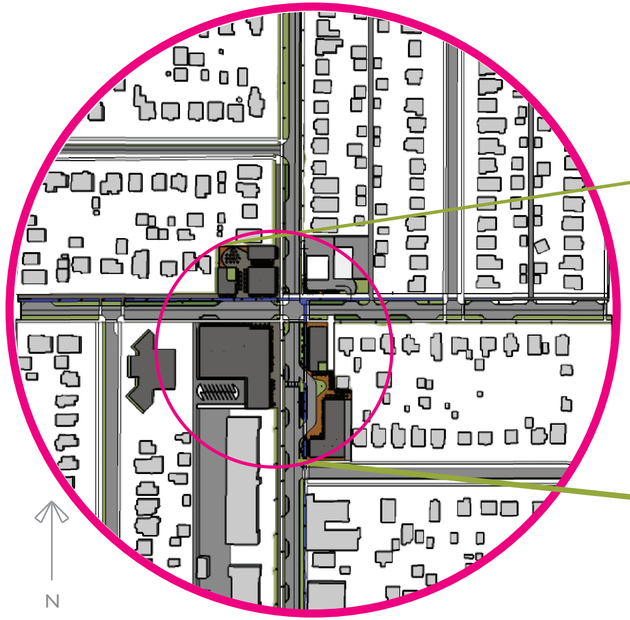


Figure 6i Master Plan

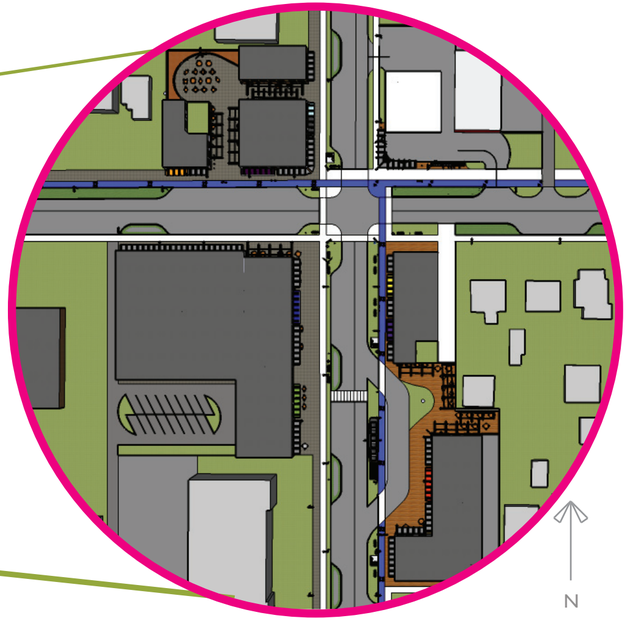


Figure 6j Zoomed in Master Plan

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

DESIGN APPLICATION

Throughout the site I incorporated various elements that provide a sense of place and adapt to the current cultural components in the Nokomis East Neighborhood. Over the next few pages, each of the details is further illustrated under the categories of streetscape, infiltration bioswales, technology and walkability.

The perspective to the right illustrates where the components that Millennials desire in neighborhoods are located in the site.

Figure 6k Overall Perspective

To create a pedestrian friendly streetscape that Millennials enjoy, I designed elements that create a sense of place and are an adaptation of the existing 1940s architecture in the neighborhood. I designed three overhangs that each store owner can customize while maintaining a sense of place in the intersection. These are made out of a durable wood, corrugated steel, canvas, and/or steel.

Then I designed a 13.5' pedestrian lighting for the site out of black anodized steel. The character fits into the historical neighborhood, but with a contemporary twist in the material and lighting style. This lighting is spaced every 40-50' throughout my site.

In an effort to incorporate the lighting within the overhangs I created a similar adaptation. The lighting allows for the space to feel safe for people as they move throughout the site in the evening.

Additionally, I designed three types of movable seating that is placed throughout the site based on store owners' color and material preferences. The fourth type of seating is a backless wooden bench that is placed along the boulevards for additional seating throughout the site typically located near the bioswales.

LIGHTING | 13.5' black anodized steel pedestrian light

Figure 6l Lighting detail

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

OVERHANG | lowers the height of the buildings & creates an inviting space

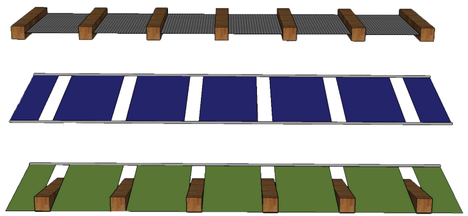


Figure 6m Overhang detail

Figure 6n Element Perspective

SEATING | individual movable & bench

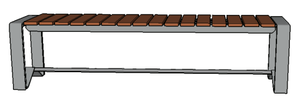


Figure 6o Seating detail

The next element important to Millennials is the environmental consciousness of a neighborhood. By incorporating infiltration bioswales and permeable surfaces into the streetscapes of the Nokomis East Neighborhood, I have increased the permeable surfaces of the site by 41%.

The primary benefits include replenishing the groundwater, reducing water runoff, and filtering the toxins out of the water before it enters its groundwater and flows into the Mississippi River near by. Some of the secondary benefits include narrowing the roadway, which reduces vehicular speeds; creating a protected bicycle route and sidewalk that encourages bicycling for all ages and riding level; and the bioswales provide storage for snow in the winter.

The plants chosen for the bioswales and the boulevards were based on resistance to salinization, zone 3-4b, and their overall appearance. Figure 6.q illustrate the trees, shrubs, grasses, and perennials incorporated into the design.

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

BIOSWALE | section

Figure 6p Infiltration Bioswale Perspective | Section

PLANT LIST | resilient to salinization, zone 3-4b & overall appearance

TREES	SHRUBS	GRASSES	PERENNIALS
red maple	bottlebrush buckeye	three square bulrush	tall coneflower
river birch	highbush blueberry	broomsedge	blue flag
pin oak	winterberry	switchgrass	cardinal flower
	arrowwood	broom panic grass	
	bayberry		

Figure 6q Plant List

As one of the major categories of transit zone elements, technology plays an important role in drawing millennials into a neighborhood. On my site I designed a transit hub bus shelter that is designed based on its ecological and technological advancement.

The transit hub's heating and digital display boards are powered by the solar panels, as to be off the grid and self-sufficient. The digital display area, also powered by the solar panels, accommodates travellers. It displays interactive route updates, allows for the purchasing of transit passes, offers the opportunity to order and download information from the Internet, and access to the television. The shelter is made primarily of glass, which allows it to be warmed by the sun in the afternoons and does not impede travelers visibility of approaching buses.

A unique aspect of this transit hub is that buses actually pull off the roadway to pick up pedestrians. The shelter acts as a protective buffer from the roadway for passengers and cyclists.

On the south side of the transit hub, I positioned a vertical bicycle shelter for the surrounding shops and those waiting for the bus to store their bikes from the elements, without impeding pedestrian space.

TRANSIT HUB | perspective

Figure 6r Transit Hub Perspective detail

glass enclosed shelter to protect pedestrians from the elements

solar panels power electrical components

high frequency bus routes

digital reader board to display next route to come

electric heater

pedestrian seating

electrical outlet

digital board for: route updates, purchasing transit passes, ordering & downloading information from the Internet & access to television

vertical bicycle shelter & rack

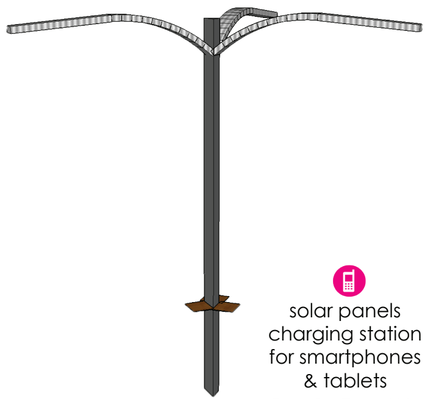
WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

Throughout the transit zone I have located Energy Hubs where people can charge their cellphones, smartphones, tablets, or any electronic device. These are powered by the three solar panels displayed in Figure 6.s.

I also incorporated a Solar Powered Bike Share with a digital route display board. The bike share is located on the north east corner of 54th Street E and 34th Avenue S next to the existing Steve's Automotive Mobil Station. I placed it here to adapt the corner into a fueling station for all types of transportation, automobiles, bicycles, and energy to fuel individuals' mobile devices.

ENERGY HUB | detail



solar panels charging station for smartphones & tablets

Figure 6s Energy Hub

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

SOLAR POWERED BIKE SHARE | perspective | detail

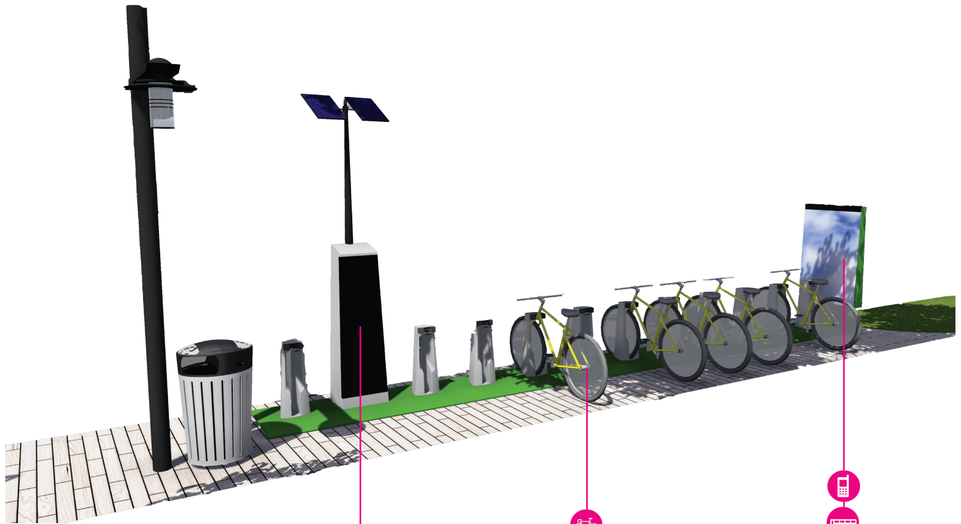


Figure 6t Solar Powered Bike Share Perspective detail

solar panels power bicycle rental kiosk & electric motors in bicycles

rentable electric bicycles increase access to pedestrian circulation

digital interactive bicycle & bus route map

The main category of transit zone elements is walkability. This category includes circulation hierarchy, navigational signage, shelter elements, bicycle elements, lighting, and environmentally conscious efforts. When addressing this portion of the design I looked at the overall transit design for pedestrians. By developing a protected bicycle route I was able to increase the accessibility of the site to people of all ages through a safe route. Additionally, the bicycle route separated the walking pedestrian from pedestrians on wheels (rollerbladers, skateboarders, and cyclists).

In the perspectives on the right page in Figure 6.u is illustrated the different elements of the site previously addressed and how they interact with the bicycle route. Other bicycle elements and navigational signage should also be noted as to where these elements are located.

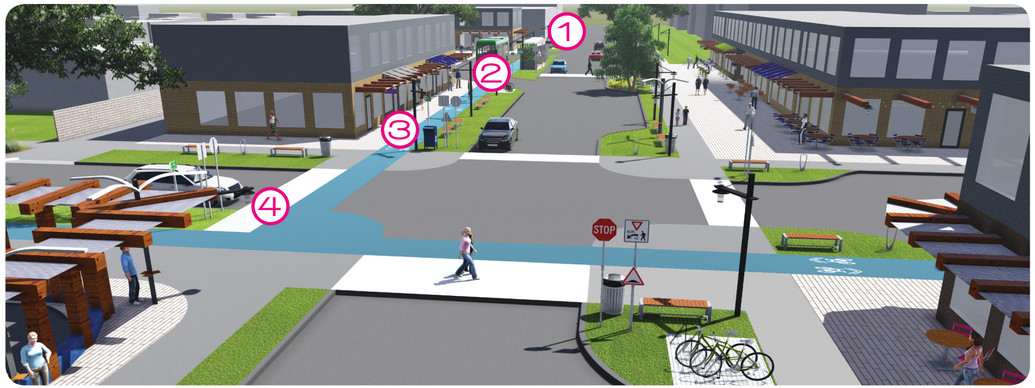
Additionally, to increase the walkability I reduced the size of the driving lanes down to two - 12' lanes with parallel parking intermittently on one side of the road with bioswales. This reduces the width of the roadway, thus reducing vehicular speeds and increase the circulation hierarchy of walkability. Another element I included within the design was raised crosswalks and intersections. This slows vehicles down as they must drive over a "speed bump" to meet the pedestrians.

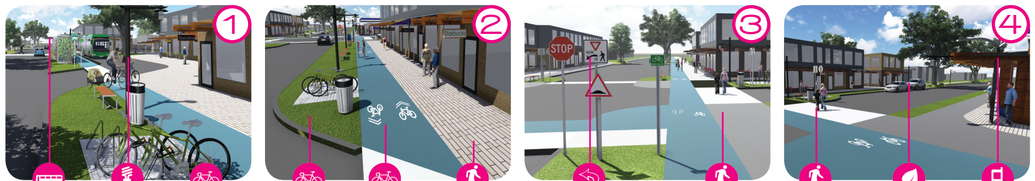
In an effort to increase the circulation hierarchy I designed expanding zones that allow more and more room for pedestrians and less room for vehicles. The boulevard furniture zones where turf grass is planted, public benches are placed, and lighting occurs, are 4' wide. The protected bicycle lanes are made out of a rubber asphalt material and are 6' wide. Bicycle routes are located on the east and north sides of streets and allow for two-way cyclist traffic on them at any time. Finally, a pedestrian zone at a minimum of 10' wide in front of mixed-use buildings encourages a safe walkable area for people to mill about.

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

PROTECTED BICYCLE ROUTE | progression





digital reader board
13.5' pedestrian light
bicycle parking station
10' turf boulevard
6' rubber asphalt protected bicycle route
permeable elongated pavers
navigational signage
10' permeable sidewalk
permeable crosswalk speedtable
infiltration bioswale
solar powered charging station

Figure 6u Protected Bicycle Route Progression and details

In addition to walkability, Millennials seek to have spaces that are private and public within a walkable distance. A design does not succeed if a place is walkable, but there are no destinations to walk to. Therefore the perspectives on these two pages illustrate one of the plaza spaces for residents and visitors of the Nokomis East Neighborhood to enjoy. Surrounding the plazas are boutiques, restaurants, retail, and residential apartments. This sort of mixed use design encourages casual interaction within the open spaces in these unique urban environments.

PUBLIC PLAZA | intimate public space

Figure 6v1 Public Plaza

PUBLIC PLAZA | pedestrian only zone

Figure 6v2 Public Plaza

WALKABILITY
within a 10min walk to amenities

TECHNOLOGY
electronic devices that make life easier

PUBLIC PLAZA | north west corner of 54th Street E & 34th Avenue S

Figure 6v3 Public Plaza Overview

Overall, Adapting: Existing transit systems for Millennials looked at incorporating elements that Millennials desire in a neighborhood, while retaining the existing character of the Nokomis East Neighborhood.

TRANSIT ZONE ELEMENTS IMPORTANT TO MILLENNIALS | within the Nokomis East Neighborhood

WALKABILITY
within a 10min walk to amenities

- circulation hierarchy
- wayfinding elements
- shelter elements
- bicycle elements
- lighting elements
- bioswale plants

TECHNOLOGY
electronic devices that make life easier

- mobile technology apps
- reader boards

PUBLIC PLAZA | north west corner of 54th Street E & 34th Avenue S

Figure 6w Nokomis East Neighborhood transit zone adapted to include elements that are important to Millennials

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AARP's Livable Communities: An Evaluation Guide helps communities evaluate their livability or accessibility for senior citizens. On pages 28-29 how public transportation can be a viable option to mobilize citizens is described. The walkability of communities is assessed on pages 54 and 55. The pedestrian system of a community is evaluated by the following criteria: availability, weather conditions, continuousness of a route, traffic conditions, street crossings, personal security, design, maintenance, and obstructions.

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Baxandall, P. (2013). *Moving off the road.* Retrieved from http://www.uspirg.org/sites/pirg/files/reports/Moving_Off_the_Road_USPIRG.pdf
Moving Off the Road provides a state-by-state analysis of the national decrease in driving. Baxandall looks into regional, population density, and income differences that would affect vehicle miles travelled. He also discusses how the economy has potential to effect the results, but gives multiple reasons that cause reasonable doubt that the economy is the primary factor.

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Generation Y totals 91 million compared to 79.4 million Baby Boomers and 74.2 million Generation X-er's, making them the largest generation yet and the demographic center of gravity of American society. Brad Broberg explains people from Generation Y (Millennials) have a different set of priorities when purchasing a home, such as their desire to live in urban, walkable communities that stress smart growth. Additionally, Baby Boomers are moving back into urban cores to be within walking distance of amenities as they age. This is causing a rise in demand for urban, walkable neighborhoods with many daily amenities.

Center for Transit-Oriented Development. (September 2004). *Hidden in plain sight: Capturing the demand for housing near transit.* Retrieved from http://www.reconnectingamerica.org/assets/Uploads/2004Ctodreport.pdf
Hidden in Plain Sight addresses trends for housing demand near transit and who lives within one half mile radius of transit stations. The results combined with population data from the U.S. Census and information found through Geographic Information Systems, the Center for Transit Oriented Development has developed projections of how many households are desired near transit by 2025. Additionally, the report includes seven different case studies and defines "Typology of Transit-Oriented Development" (32).

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The City of Minneapolis developed a ten year transportation action plan that is made of six components: Downtown Action Plan, Citywide Action Plan. Design Guidelines for Streets and Sidewalks, Streetcar Planning, Pedestrian Master Plan, and a Bicycle Master Plan. Each component is detailed out in a set of documents about implementation, goals, feasibility, and details.

Deakin, E. (2003). *Sustainable development and sustainable transportation: Strategies for economic prosperity, environment quality, and equity.* Retrieved from http://www.uctc.net/papers/519.pdf
Elizabeth Deakin's paper reviews sustainable transportation as a part of a broader strategy of transportation and land use planning for sustainability. She discusses the potential of transit-oriented development and brownfields as potential sites for sustainable planning. The paper concludes with topics that Deakin believes needs more research and a categorized bibliography on sustainable development topics.

Dutzik, T., & Baxandall, P. (2013). *A new direction.* Retrieved from http://uspirg.org/sites/pirg/files/reports/A%20New%20Direction%20vUS.pdf
A New Direction illustrates that the Driving Boom has ended, thus bringing uncertainty to the future of transportation. Changes in transportation priorities amongst the Millennial generation, the advancement of technology, and other changes prove that the United States needs to create a new transportation policy that meets these changing needs. The article provides potential scenarios of future driving trends and the effects they will have on current transportation policy.

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Unlocking Generational Codes helps people understand people of all generations. Anna Liotta tries to bridge the generation gap through effective communication styles for each generation.

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Anna Liotta is the creator of Generationally Savvy™ Communication Solutions, an auther, speaker, and consultant on generational differences in the work place. Liotta discusses how people can overcome the generation gap to effectively communicate.

Litman, T. and Burwell, D. (2006). *Issues in sustainable transportation, Int. J. Global Environmental Issues,* 6(4), 331–347. Retrieved from http://www.vtpi.org/sus_iss.pdf
Litman and Burwell explain that sustainable transportation planning raises a variety of problems such as how goals, objectives, and sustainability are defined and evaluated as well as the type of decision-making process that should be used when designing transportation systems. Further they discuss two different models used for defining transportation, series models and parallel models, which can be used to improve transit. Indicators of transit sustainability can also be broken down into simple and complex categories. All approaches help to determine the sustainability of a transit system.

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Live MSP provides information on Minneapolis and St. Paul, Minnesota neighborhoods. It provides boundaries and zip codes, history, housing styles, schools, public facilities, news, and statistics for the neighborhoods.

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Barbara McCann describes the trend towards complete streets, meaning designing streets with all forms of transportation and beautification in mind. When streets are designed holistically, their surrounding neighborhoods become inviting places for people to live, work, and play.

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This website summarizes the history of transit systems in the Twin Cities, Minneapolis and St. Paul, Minnesota. It discusses the different types of transportation developed and why they were disregarded after 1959.

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Portland City Council. (September 2009). *Portland streetcar system concept plan: a framework for future corridor planning alternatives analysis.* Retrieved from http://www.portlandoregon.gov/transportation/article/321180
Portland assessed transit corridors citywide to determine which corridors have the best potential for future streetcar investment. The document discusses the benefits of streetcar networks. Additionally, the document frames the planning process, concept plan, economic development potential for the corridors, and implementation possibilities.

Rue, H., McNally, L., Rooney, K., Santalucia, P., Raulerson, M., Lim-Yap, J., …Burdan, D. (2013). *Livability in transportation guidebook: planning approaches that promote livability.* Retrieved from http://www.fhwa.dot .gov/livability/case_studies/guidebook/livabilitygb10.pdf
The guidebook walks through how livability principles have been successfully integrated into transportation planning, programming, and project design in all levels and types of sites. Case studies are used to exhibit the visioning, planning and process, policy, partnership, design, and implementation and funding stages of livability.

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Schwartz discusses the trend that younger people are not driving as much as previous generations have at the same age. He states through examples that this is due to advancements in mobile technology, which make public transportation more accessible.

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This site elaborates on the Americans with Disabilities Act, explaining in detail the law and regulations. ADA standards for design are found on the site as well.

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The U.S. Department of Transportation has put together a draft of plans to improve the livability of communities through collaboration with HUD and EPA for FY 2014-2018. The plan covers challenges, strategies, and ways to measure the successfulness of transportation improvements upon the livability of communities.

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The United States High Speed Rail Association has developed a plan that would connect 80 percent of Americans by High Speed Rail lines that travel 220 miles per hour. This network could be implemented by 2030 at a cost on $500 billion.

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Value Options describes the four generations present in today's world: Traditionalist, Baby Boomers, Generation X, and Generation Y (Millennials). For each generation a synopsis of major events and innovation that has occurred during the formative years of the generation. Additionally, characteristics of each generation make comparing generations simple.

Walk Score®. (2013). Retrieved from http://www.walkscore.com/
Walk Score® use geographic information systems to measure the number of amenities near an address. Then each amenity is given a point value based upon the proximity to the address. The more points the higher the walkability score of the address. Walk Score® also assesses the transit and bike systems.

Zipcar. (February 2013). *Millennials and technology*. Retrieved from http://www.slideshare.net/Zipcar_Inc/millennial-slide-share-final-16812323
Zipcar surveyed 1,015 adults including 980 licensed drivers. The findings suggest that increased availability of on-demand mobility services helps Millennials drive less and makes it easier for them to live without a car. Transportation applications for mobile devices (transportation "apps") have a greater impact on Millennials' driving decisions than on the decisions of Baby Boomers. Technology is more important to Millennials than owning a car. Traditional influences, like the high cost of car ownership and environmental concerns of driving, are compelling many Millennials to drive less.

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Figure 1-c - page 2
Baxandall, P. (2013). Moving off the road. Retrieved from http://www.uspirg.org/sites/pirg/files/reports/Moving_Off_the_Road_USPIRG.pdf

Figure 1-d - page 5
Illustration created by Anna Eckberg.

Figure 1-e - page 6
Photograph captured by Anna Eckberg in New York City in an underground subway station in April 2013.

Figure 1-f - page 7
Photograph captured by Anna Eckberg while travelling by train from London, United Kingdom to Liverpool, United Kingdom.

Figure 1-g - page 11
Retrieved from http://www.epa.gov/smartgrowth/partnership/

Figure 2-a - page 17
Retrieved from http://4.bp.blogspot.com/-ZGV9azB5_zg/ULKvjqlf-EI/AAAAAAAAA50/Ca_lOP8P_Ho/s640/080325_lightrail_004.jpg

Figure 2-b - page 17
Retrieved from http://www.fltod.com/research/tod_planning_and_fbc_outside_florida/muncipalities/charlotte/charlottes_south_corridor_blue_line.pdf

Figure 2-c - page 18
City of Charlotte. (2011). The city of Charlotte transportation action plan policy document. Charlotte, NC.

Figure 2-d - page 19
City of Charlotte. (2011). The city of Charlotte transportation action plan policy document. Charlotte, NC.

Figure 2-e - page 19
Rue, H., McNally, L., Rooney, K., Santalucia, P., Raulerson, M., Lim-Yap, J., …Burdan, D. (2013). Livability in transportation guidebook: planning approaches that promote livability. Retrieved from http://www.fhwa.dot .gov/livability/case_studies/guidebook/livabilitygb 10.pdf

Figure 2-f - page 19
Retrieved from http://charmeck.org/city/charlotte/cats/Bus/Pages/mobileapp.aspx

Figure 2-g - page 20
Graphic created by Anna Eckberg to illustrated the location of existing transit systems across the United States.

Figure 2-h - page 21
Portland City Council. (September 2009). Portland streetcar system concept plan: a framework for future corridor planning alternatives analysis. Retrieved from http://www.portlandoregon.gov/transportation/article/321180

Figure 2-i - page 22
Graphic created by Anna Eckberg with information from Walk Score®. (2013). Retrieved from http://www.walkscore.com/

Figure 2-j - page 23
Photograph captured by Anna Eckberg in Bloomington, Minnesota in October 2013. Pictured from left to right is Eric Eckberg and Jody Eckberg.

Figure 2-k - page 23
Photograph captured by Anna Eckberg in New York City on a greenroof in Central park in April 2013. Pictured from left to right are Amanda Ahrenholz, Johannah Wiege,Bailey Krause, Anna Eckberg, Adam Boole, and Joseph Starbuck.

Figure 2-l - page 23
Photograph captured by Anna Eckberg in Red Wing, Minnesota at Covill Park in July 2013. Pictured is Jason Ide.

Figure 3-a - page 35
Graphic created by Anna Eckberg to represent the design process of this thesis.

Figure 3-b - page 36
Graphic created by Anna Eckberg to depict timeline of thesis work time during Fall 2013.

Figure 3-c - page 37
Graphic created by Anna Eckberg to depict timeline of thesis work time during Spring 2014.

Figure 5-a - page 51
Graphic created by Anna Eckberg to show the site location for the example application.

Figure 5-b - page 53
Photograph captured by Anna Eckberg in Minneapolis, Minnesota at 50th Street Light Rail Station in October 2013.

Figure 5-c - page 53
Retrieved from http://31.media.tumblr.com/c9b764e8957c676fd2a6d05cd6804bd7/tumblr_mlxm4n4hiO1qzu6w8o1_r2_1280.jpg

Figure 5-d-1,2,3,4,5 - pages 54-55
Graphic created by Anna Eckberg from information from City-Data. (2013). Minneapolis, Minnesota. Retrieved from http://www.city-data.com/city/Minneapolis-Minnesota.html

Figure 5-e-1,2, 3, 4, 5, 6, 7, 8 - pages 56-59
Graphics created by Anna Eckberg from information from City-Data. (2013). Minneapolis, Minnesota. Retrieved from http://www.city-data.com/city/Minneapolis-Minnesota.html

Figure 5-f - page 60
Graphic created by Anna Eckberg

Figure 5-g - page 60
Photograph captured by Anna Eckberg in Minneapolis, Minnesota on Keewaydin Street in October 2013.

Figure 5-h - page 61
Retrieved from http://www.thudscave.com/petroglyphs/grafx/Minn_Large.jpg

Figure 5-i - page 61
Photograph captured by Anna Eckberg in Minneapolis, Minnesota on the Nokomis Parkway in October 2013.

Figure 5-j-1,2,3,4 - page 61
Photographs captured by Anna Eckberg in Minneapolis, Minnesota in October 2013.

Figure 5-k-1,2,3,4,5 - page 62
Photographs captured by Anna Eckberg in Minneapolis, Minnesota in October 2013.

Figure 5-l-1,2,3,4 - pages 64-65
Photographs captured by Anna Eckberg in Minneapolis, Minnesota in October 2013.

Figure 5-m - page 66
Graphic created by Anna Eckberg with information from the Minneapolis GIS database.

Figure 5-n - page 67
Graphic created by Anna Eckberg with information from the Minneapolis GIS database.

Figure 5-o - page 68
Graphic created by Anna Eckberg with information from the Minneapolis GIS database.

Figure 5-p-1,2,3 - page 69
Photographs captured by Anna Eckberg in Minneapolis, Minnesota in October 2013

Figure 5-q-1,2 - page 70
Photographs captured by Anna Eckberg in Minneapolis, Minnesota in October 2013.

Figure 5-r - page 70
Photographs captured by Anna Eckberg in Minneapolis, Minnesota in October 2013.

Figure 5-s-1,2,3 - page 71
Photographs captured by Anna Eckberg in Minneapolis, Minnesota at Keewaydin Park, Morris Park, and Bossen Park in October 2013.

Figure 6-a - page 76
Graphic created by Anna Eckberg with information from City-Data. (2013). Minneapolis, Minnesota. Retrieved from http://www.city-data.com/city/Minneapolis-Minnesota.html

Figure 6-b - page 77
Graphic created by Anna Eckberg to represent the elements Millennials desire in a transit zone.

Figure 6-c - page 78-79
Graphic created by Anna Eckberg to depict the geographic location of Nokomis East Neighborhood.

Figure 6-d - page 80
Graphic of existing transit systems in Minneapolis created by Anna Eckberg with data from ArcMap.

Figure 6-e - page 81
Graphic of adapting transit systems in Minneapolis created by Anna Eckberg with data from ArcMap and knowledge discovered during research.

Figure 6-f - page 83
Graphic of classifying transit systems in Minneapolis created by Anna Eckberg with data from ArcMap and knowledge discovered during research about transit oriented development.

Figure 6-g - page 84
Graphic created by Anna Eckberg to represent existing intersection hierarchy.

Figure 6-h - page 85
Graphic created by Anna Eckberg to represent proposed intersection hierarchy.

Figure 6-i - page 86
Graphic created by Anna Eckberg of Master Plan in SketchUp and Lumion.

Figure 6-j - page 87
Graphic created by Anna Eckberg of Master Plan in SketchUp and Lumion.

Figure 6-k - page 89
Graphic created by Anna Eckberg in Lumion of entire site.

Figure 6-l - page 90
Graphic created by Anna Eckberg in SketchUp.

Figure 6-m, n, o - page 91
Graphic created by Anna Eckberg in SketchUp and Lumion.

Figure 6-p - page 93
Graphic created by Anna Eckberg in Lumion and Photoshop.

Figure 6-q - page 93
Table created by Anna Eckberg to illustrate plants used on site.

Figure 6-r - page 94-95
Graphic created by Anna Eckberg with SketchUp and Lumion.

Figure 6-s - page 96
Graphic created by Anna Eckberg with SketchUp.

Figure 6-t - page 97
Graphic created by Anna Eckberg with SketchUp and Lumion.

Figure 6-u - page 99
Graphic created by Anna Eckberg with SketchUp and Lumion.

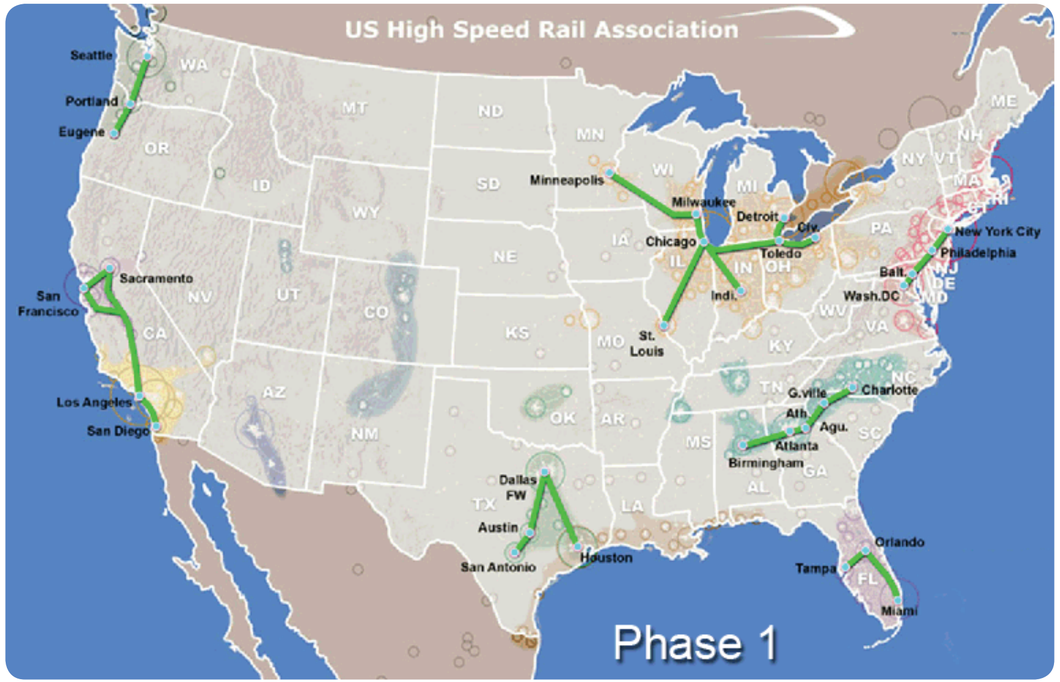
Figure 6-v.1-3 - page 100-101
Graphic created by Anna Eckberg with SketchUp and Lumion.

Figure 6-w - page 103
Graphic created by Anna Eckberg with SketchUp and Lumion.

Table A - Illustration of the Criteria for this thesis - created by Anna Eckberg

Criteria	Priority 1-10 (10 is high)	Met Yes or No	Plan to improve or incorporate, if not currently met
Walkability			
1. Public transportation is already incorporated into the infrastructure of the city.			
2. There is potential to create a multimodal transportation system (2+ systems).			
3. Existing active or inactive rail lines are present on or within a mile of the site.			
4. Transportation is accessible to multiple generations.			
5. Previously, the public transit system has been underdeveloped or underutilized.			
6. Density of population is high.			
7. Current city population of 100,000 to 500,000.			
8. The site experiences all four seasons.			
9. Within the neighborhood site there are at least the following cultural necessities: 1-grocery store, 2-places of worship, 1-salon, 5-commercial buildings, 1-park, 1-school, 3-restaurants, and residential buildings.			
10. The existing walkability score is between 40 and 70 according to Walk Score®.			
Technology			
1. Technology is available to make public transportation more accessible.			
2. Millennials currently live on the site and the median age for the city falls between 20 and 35.			
Political Interest in Livability and Transit			
1. Within the past decade the city has developed a plan for improving transportation within the next 25 years.			
2. Other Millennial values are present on the site such as amenities in close proximity (grocery store, restaurants, library, etc.).			
3. Millennial population has grown over the past decade.			
4. Baby Boomers are present within the population.			
5. Potential to increase social interaction amongst generations through use of transportation.			

High Speed Rail Network Phase 1 in relationship to the ten megaregion transit systems (United, 2013).



High Speed Rail Network Phases 1-4 to be completed by 2030 (United, 2013).